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An Improved Automatic Chucking Machine

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A 6x6¾-in. automatic chucking machine with important features —Comparatively small and compact design—Small turret feed cam and unique threading device—Adjustable individual spindle speeds

A RECENTLY developed automatic machine for turning, boring, facing, threading and reaming operations on work up to 6 in. in diam. and 6¾ in. long has many features of interest and a wide range of usefulness. The machine is now being manufactured by the Goss & DeLeeuw Machine Co., New Britain, Conn.

Broadly speaking, the machine consists of a bed, cast integral with the headstock in which are journaled the working spindles, four in number. At the other end of the bed, a work turret is mounted in a housing which is carried to and from the tools by the action of a cam. The turret is indexed by an automatic mechanism, and a wide range of speeds, on individual spindles, and feeds, without changing the cam, are available through change gears. The parts of the machine are so placed in relation to each other that the operator has an unobstructed view of all tools while the machine is in operation and the controls are conveniently located at the front of the machine. Fig. 1 shows the front of the machine with headstock at the left and turret at the right. A single 12-in. belt pulley for a 2-in. belt drives the machine and runs at 500 r.p.m. The pulley may be driven from a countershaft or by a motor mounted on a special base at the rear. When motor driven, a 5-hp. motor is recommended.

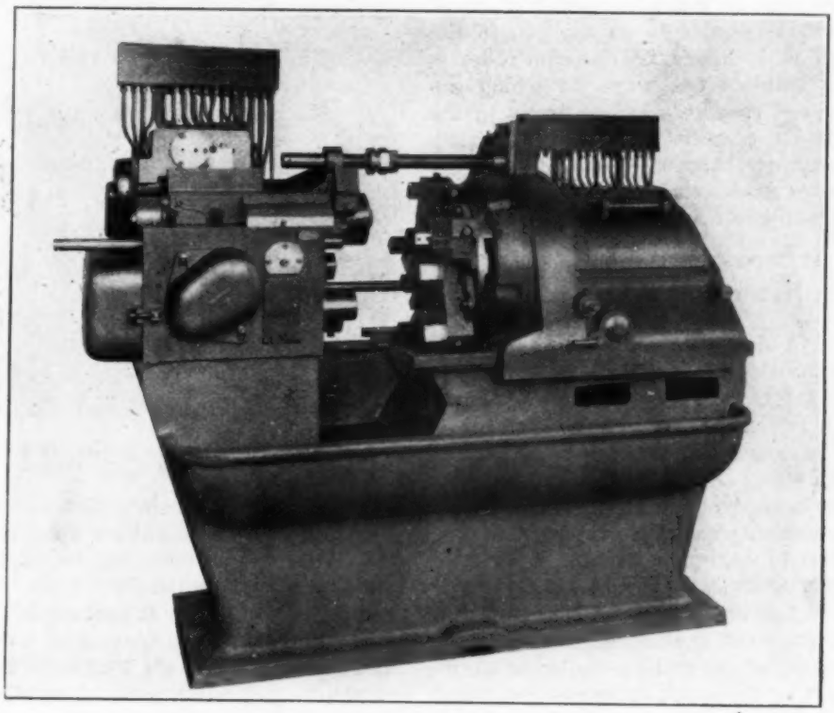


FIG. 1—GOSS & DE LEEUW AUTOMATIC CHUCKING MACHINE

The feed shaft is driven through spur and bevel gr from the drive shaft, runs at 300 r.p.m., and is pinned in the turret housing, to one driving member of a double throw clutch. The other driving member of the clutch runs loose on this shaft and is geared to the hand feed shaft. The sliding member of the clutch also runs loose and has a gear cut on its circumference which meshes with a wide-faced gear on a shaft of the indexing and cam driving mechanism, so that this mechanism is operated by hand or power according to which side of the clutch is in engagement. The clutch is shifted by a hand lever at the front of the machine. This arrangement makes it easy to shift from power to hand feed, but makes it impossible to have both in mesh at the same time. The position of feed shaft and drive shaft are shown in Fig. 2, which is the rear view of the machine. The feed cam is only 9 in. in diam., the dimension being small by virtue of the fact that the cam is stationary during the turret

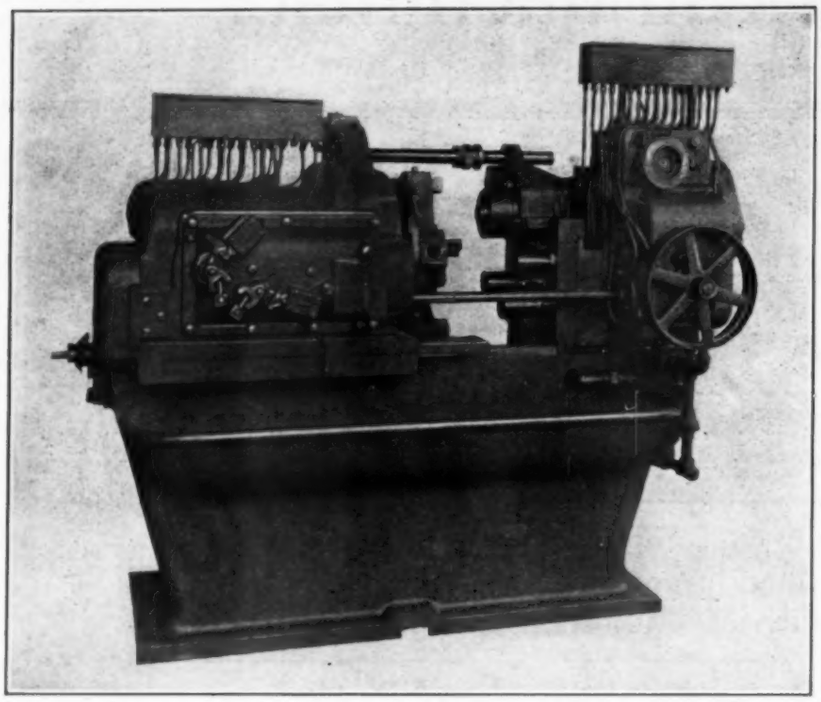


FIG. 2—REAR VIEW OF AUTOMATIC CHUCKING MACHINE

indexing period, and the feeding section of the cam is therefore able to occupy all but one inch of the circumference. The cam rotates freely on the turret spindle and is driven by a worm and wheel, the worm wheel being bolted to the drum. The cam housing has a removable cover and Fig. 3 shows the arrangement of the cam in the housing and one section of the cam being removed.

The cam track is machined in two half-cylindrical cast-iron sections which are bolted to the drum. These sections are interchangeable and a number of specially adapted cams may be kept on hand for jobs that recur regularly, although it is possible to do any job in the range of the machine with one cam. The cam roller is mounted on a slide between the ways on which the housing slides. The roller slide is locked firmly to the bed during operation but may be positioned accurately by means of the micrometer-head screw shown in Fig. 4. This adjustment serves to determine the farthest point of the turret movement and thus the depth of the cut.

The Turret Cycle

The cycle of the turret mechanism is made up of four periods as follows:

1—Indexing period in which the feed cam is stationary.

2—Quick traverse in which the work is brought up to the cutting tools and the cam revolves at the high speed.

3—Feed period in which the machining is done and the cam revolves at a slow speed.

4—Quick return in which the turret is returned to its original position, the cam revolving at the higher speed.

The mechanism which automatically controls this cycle is of sufficient interest to warrant a detailed description and is shown diagrammatically in Fig. 5. A feature of the action is that the feeding periods and the indexing periods cannot overlap, since the feed is thrown in by the indexing device as it stops, and the indexing motion is started by the cam as the quick return is completed.

Shaft *A* is driven from the feed shaft clutch as explained above and the arrangement of the other parts will be evident from the diagram. At the beginning of the cycle clutch *N* is in mesh with gear 3 having been left there at the completion of the preceding operations. Clutch *M* is thrown out of mesh with gear 1 and into mesh with gear 2, thus stopping the cam, and shaft *A* then drives the indexing shaft causing the turret to rotate to its next position.

At this point a safety feature of the machine should be noted. All clutches are thrown by a lost motion device by means of which the latter part of the movement is completed by a spring under compression. These devices are shown on the turret housing in Fig. 2. The indexing action is started through the movement of clutch *M* by a lug on the cam which can be seen in Fig. 3, but before the clutch is in mesh with gear 2 it meets a movable stop and is held under spring pressure, ready to engage when the stop is removed. This stop is moved by a knob at the front of the machine and it is evident that the knob must be pulled before indexing can commence. The position of the knob can also be noted in Fig. 3 at the right-hand end of the housing.

As soon as the operator completes the placing of the work in the chuck, therefore, he pulls the knob and the indexing can start when the return of the slide is completed. The knob may be pulled at any time as soon as the work is placed, and the machine will not stop unless the operator has consumed more time than allowed by the cycle. This arrangement gives safety and confidence

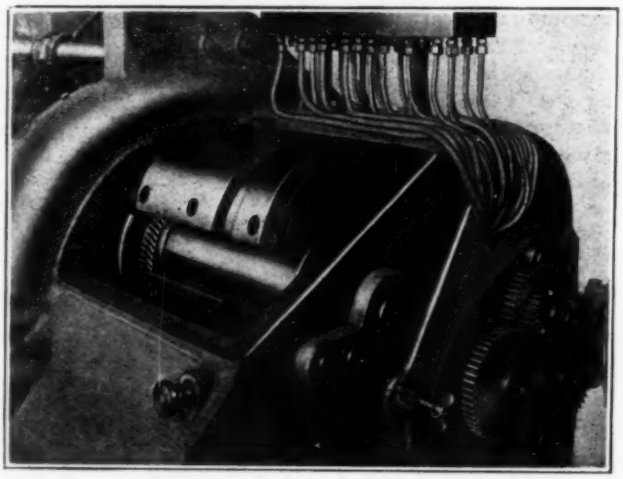


FIG. 3—CAM HOUSING COVER REMOVED SHOWING CAM DRUM AND TRACK SECTIONS

to the operator as the machine will not index until he is ready and, in cases where the operation will permit, more than one machine may be handled by one operator.

Coming back to the feed driving mechanism, the indexing motion is now in operation. A dog on the Geneva crank arm, at the conclusion of indexing, throws clutch *M* into mesh with gear 1 and the drive is from shaft *A* to shaft *B*, through gears 1 and 3, and then by bevel gears to the cam worm and wheel. This is the high speed motion.

As the work approaches the tools, clutch *N* is disengaged from gear 3 and goes into mesh with 4, so that the cam is driven from shaft *A* through the reduction gear train at the right of the diagram. Change gears are in this train and make possible a variety of feeds with a given cam. The change gears are located under the cover, shown in Fig. 4 at the end of the machine.

When the machining operations have been completed, the clutch *N* is again meshed with gear 3 and the turret is quickly returned to its starting position ready for indexing. It will be noted from the above that but one clutch is shifted at a time and that the quick traverse and return speed is constant.

The turret is mounted on a heavy shaft, on which the

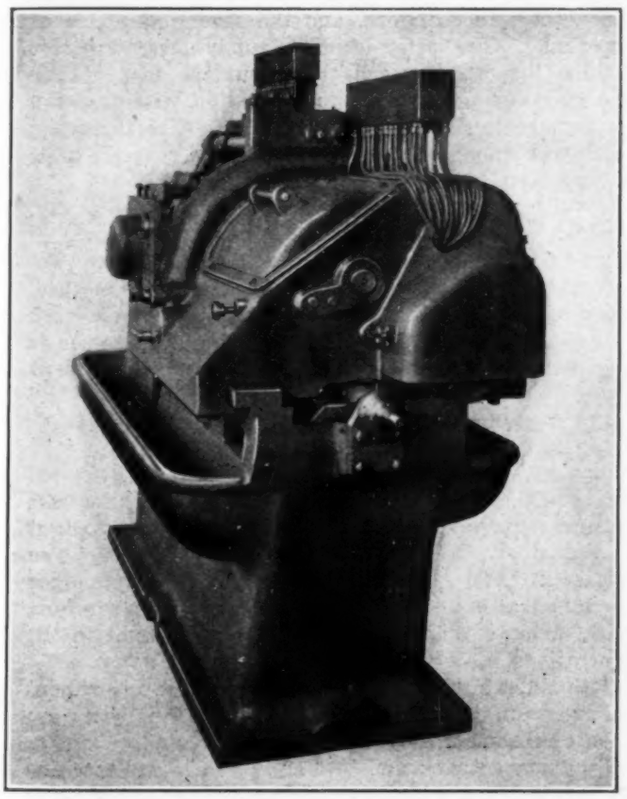


FIG. 4—TURRET END VIEW SHOWING CONTROLS AND FEED ADJUSTMENT

feed cam also rotates as mentioned above, and is indexed by a Geneva-stop motion located in the housing and directly back of the main bearing. This arrangement decreases the twist in the shaft, and the fact that the index wheel is larger than the diameter of the circle on which the work is located causes accurate indexing. The turret body has a circular beveled plate on its back next to the housing, and against a similar plate attached to the housing itself. The beveled edges of these two plates form a circular V-section clamping surface which is surrounded by a split-ring which fits over the V. When this ring is tightened, the turret is held stationary against turning and at the same time the wedging action in the V tightens the turret body squarely against the housing. A lock bolt is also arranged to enter notches in the circumference of the Geneva plate. The clamping ring is operated by the cam shown on the indexing shaft in Fig. 5, the lock bolt being withdrawn by the Geneva roller and re-entering the notch under spring pressure. The turret shaft extends through a bearing at the end of the housing.

The chucks are of special design and are one of the features of the machine, since the slots through which

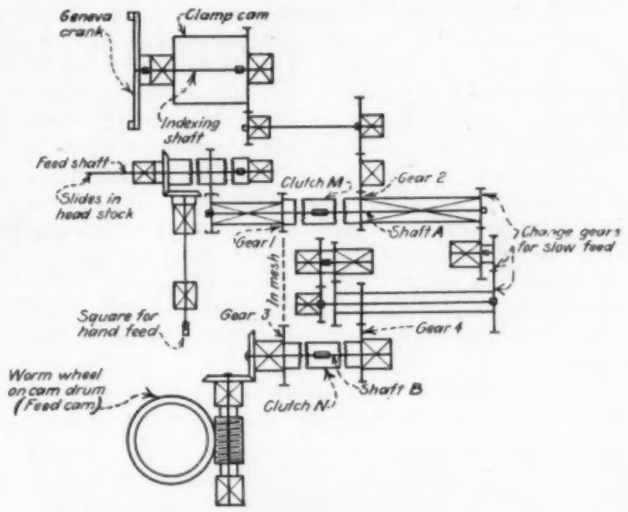


FIG. 5—DIAGRAM ILLUSTRATING ACTION OF TURRET INDEXING AND FEED MECHANISM

the jaws project do not extend across the whole face of the chuck. The threaded portions of the jaws are circular in cross-section and fit accurately in the hole in the chuck body. The face of the chuck body is, therefore, solid at the center and there is practically no give to the jaws as they are tightened on the work. The chucks have a wide bearing on the turret and the bolt holes in the plate have hardened removable bushings.

The machine drive shaft extends through to the front of the headstock and drives the gear, at the center of the circle on which the spindles are spaced, through a set of change gears and bevels. By substituting various change gears the speed of all the spindles may be changed at once, and change gears between the spindle

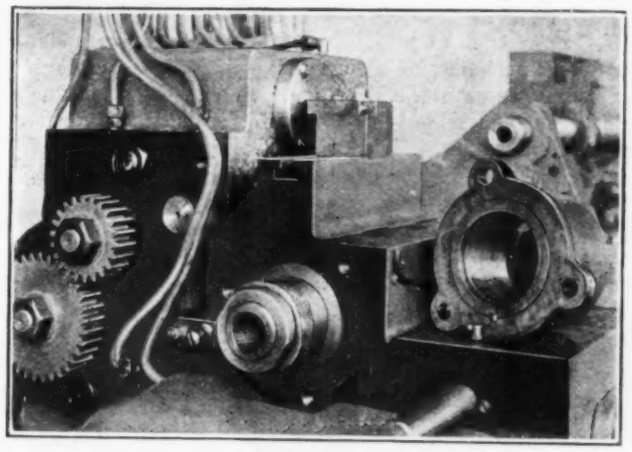


FIG. 6—THREADING SPINDLE LEAD SCREW, NUT AND CHANGE GEARS

drive gear and the spindles make the speeds of the individual spindles adjustable with respect to the others. All of the spindles are continually in gear with the exception of the threading spindle which is driven through a clutch.

The threading mechanism of this machine is of especial interest since the taps and dies do not draw

themselves into the work, but are fed in by lead screws of the same pitch as the thread being cut. Both inside and outside threads may be cut at the same time and of the same or different pitches.

The threading spindle carries the tap at the front end and has a master or lead screw fastened at the rear end. The lead nut is bolted to the threading slide in which the spindle is mounted, and different screws and nuts may be easily put in place for various pitches. The arrangement of the threading spindle and lead screw is shown in Fig. 6. A sleeve is feather-keyed to the spindle and carries the die for outside threading. This sleeve also carries a lead screw which is threaded into a nut, which can be seen in Fig. 2, on the front face of the slide, and a gear which meshes with a long pinion. This pinion is driven through a double-throw clutch which is thrown into mesh to start the rotation of sleeve and spindle.

A device, geared to the spindle, disengages the clutch and throws it to the reversing position when the required number of turns of the spindle have been made. This device consists of a cam disk with adjustable dogs and appears above the driving pulley in Fig. 2. The reverse action causes the threading tools to be withdrawn from the work, and when the spindle has reached its original position, the clutch is again disengaged. The connection between cam and clutch is similar to that for shifting the turret clutches and, in a similar way, a stop or detent holds the clutch out of engagement under spring pressure when the spindle stops. To start the threading action of the spindle and sleeve it is only necessary to release the detent.

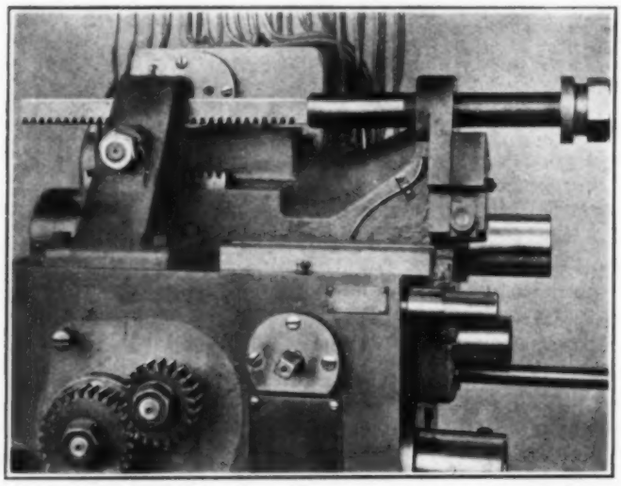


FIG. 7—THREADING SPINDLE DRIVE FOR REAMING OPERATION

Action of Spindle and Sleeve

It will be noted that the driving mechanism of the spindle and sleeve causes them to start from a state of rest, make a predetermined number of revolutions during which they travel forward under the influence of the lead screws, reverse themselves, return to their original positions and stop. This action, in order to be available for cutting threads on work held in the turret chucks, could not be applied if the spindle lead nuts remained stationary as the turret approached. It is for this reason that the spindle, sleeve and nuts are mounted on the slide mentioned above.

This slide is pushed along, as the turret feeds toward the work, by a nut on a threaded rod attached to the turret housing as shown in Fig. 1. The nut is so set that, just before the work meets the threading tool, the nut strikes the threading slide and causes the slide with all its mechanism to move at the same speed as the work. In addition, a lock on the slide snaps into the groove in the nut so that the turret and the threading slide are positively locked together throughout the threading operation. When the turret moves back, the threading slide also moves to its original position where the lock is disengaged and the turret continues to its indexing position.

Threading by Lead Screws

The major advantages of this threading mechanism are the use of lead screws, so that the tools do not draw themselves into the work, and the reversing action of the spindle. The latter is important because with this machine the operator can throw out the feed at any time, even during the threading operation, without doing any damage to the machine or the tap. The threading device will simply complete its operation, reverse, draw out and stop.

The threading spindle can also be used for reaming, in which case the mechanism is arranged as shown in Fig. 7. The spindle reversing clutch and lead screws are disconnected and a rack and pinion device is installed. This device causes the slide to be driven toward the work at twice the speed of the turret feed. The reamer is mounted in the spindle which can be given a slow speed by change gears, and the quick feed combined with slow rotation gives a good reaming action.

Provisions for Lubrication

The cutting lubricant reservoir is located in the base of the machine and the pump is mounted at the back of the headstock, directly under the drive shaft, as shown in Fig. 2. The lubrication of all bearings and other moving parts is taken care of by the two oil reservoirs, shown mounted above the headstock and turret in the illustrations.

Both slides have full-length taper gibs for adjustment and are accurately machined. The important gears are made of chrome-nickel steel and heat-treated.

The compactness and availability of the machine are well illustrated by the fact that its over-all length is but 68 in. and the cycle time adjustment is from 7 to 56 sec. Especial attention has been paid in the design to simplicity of control, accuracy of operation and a wider range of adjustment than is usually possible on high-production machines.

Electrical Exports Show Increase

United States exports of electrical materials during July of this year exceeded the shipments made in the same month of 1922 by almost $1,700,000, bringing the average for this year up to a point well in advance of the 1922 figures, according to *Commerce Reports*, published by the Department of Commerce. A substantial increase was also shown over the June exports of electrical goods. Heavy power machinery, together with radio apparatus and bare copper wire, showed the largest gain during July. Unusually heavy shipments of large motors and electric locomotives were also made. Decreases as compared with the previous month were mainly in appliance lines and supplies.

Automotive Service Methods and Equipment

By HOWARD CAMPBELL
Western Editor, *American Machinist*

Twentieth article—Re-grinding pistons—Broaching wrist-pin bushings—A home-made cylinder honing tool—Boring main bearings—A number of useful ideas

THAT adequate service facilities must be maintained if an automobile is to be marketed successfully is becoming more evident every day. The unusual success of the Vesper-Buick Motor Co., St. Louis, Mo., is credited by that firm to the use of the good tools and equipment described here.

The Franklin valve-grinding machine is a familiar object in the well-equipped repair shop, but the use of the same machine for grinding pistons is not so common. A piston in process of regrinding is shown in Fig. 1. To the front of the machine is attached an auxiliary table that can be fed longitudinally or across, using the handwheels shown. Two brackets that are bolted to the table support a shaft which carries two adjustable arms, one of which carries an ordinary center, the other carrying a bearing for a small shaft. On one end of the shaft is a bull-center and on the other end is a pulley that is driven from the motor through the medium of a countershaft. A double pulley on the motor makes it possible to drive the countershaft and the grinding wheel at the same time. The piston is held between the small center at the closed end and the bull-center in the open end, the bull-center serving to drive the piston when power is applied. The wheel used is a 6x½-in. Norton 6660-M. Pistons that have been turned oversize but not ground are kept in stock for use with cylinders that have been re-reamed oversize. A set of pistons can be ground to size in from 45 min. to 1½ hours.

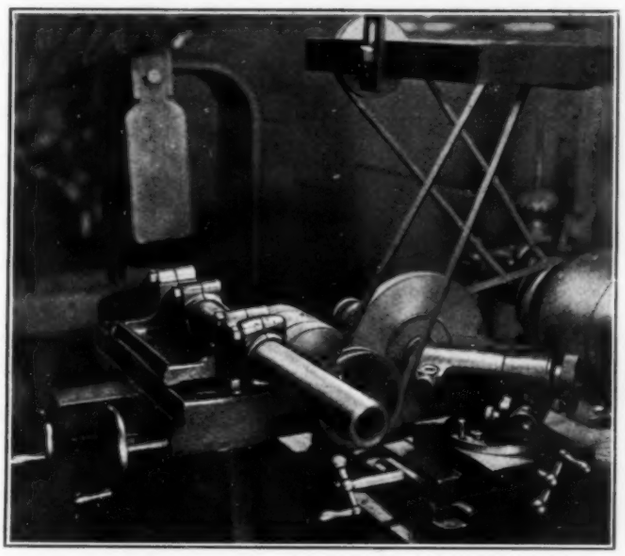


FIG. 1—REGRINDING A PISTON ON A VALVE GRINDER

The operator shown in Fig. 2 is re-seating a valve cage, using the machine described above. The tool is located on a vertical shaft that is driven from the motor shaft through a pair of bevel gears. The vertical shaft is long enough to project up through the valve stem hole in the cage, thus holding the cage true with the tool so that the valve seat will be true with the seat on the valve head. The seats in a set of valve cages can be re-reamed and the valves ground complete in approximately 40 minutes.

The task of assembling the plates of a disk clutch is not easy unless one has the proper equipment, such as the clamping arrangement shown in Fig. 3. To the bench is bolted an iron plate, on which the parts of the clutch are assembled.

A foot lever is hinged to the back of the bench at a point near the floor so that it will extend to the front

FIG. 2—RESEATING A VALVE-CAGE

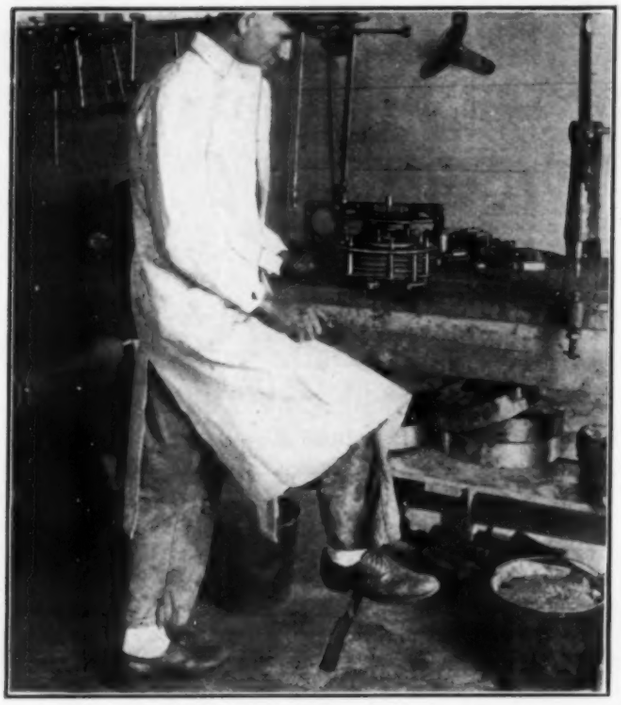


FIG. 3—FIXTURE FOR ASSEMBLING A DISK CLUTCH

of the bench, crossing under the center of the plate. An iron rod is hinged to the foot lever, the rod being long enough to project vertically through the plate and a set of disks, with room for a U-clamp and a nut on the upper end. When the disks and spring are in position, the U-clamp and nut are put on the rod and the foot lever is forced down, thus compressing the spring and holding it so that the nuts can be assembled to the bolts without difficulty. A clutch can be assembled in five minutes with this apparatus.

A tool for use in assembling valve springs to valve

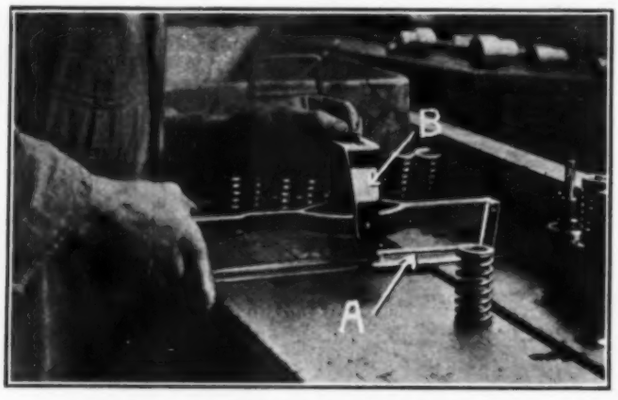


FIG. 4—COMPRESSING A VALVE SPRING

cages is shown in Fig. 4. It consists of a bottom plate *A* in which is a locating seat for the cage and a top lever to which is attached a U-shaped section *B* that slips over the valve cage and valve spring. A slot in the top of the U-section allows the end of the valve stem to protrude. Bearing down on the top lever compresses the spring and allows the operator to insert the cotter-pin into its hole in the valve-stem without difficulty.

The operator shown in Fig. 5 is broaching the hole in a piston pin bushing that has just been pressed into the small end of a connecting rod, using a machine and set of broaches made by the Sheldon Machine Co., 401 East 29th St., Chicago, Ill. The teeth at the lower end of the broach are small enough so that they will enter the hole in the bushing, each succeeding tooth being a few thousandths of an inch larger. The top teeth bring the hole nearly to size and then the smooth straight section at the upper end of the tool expands and burnishes the hole to size. This method of finishing holes is in accord with the most modern shop practice and produces excellent results. With the outfit shown the operator can broach the bushings in six rods and fit the pistons to the rods in approximately 20 minutes. The illustration, Fig. 6, shows a set of Sheldon broaches, which includes tools for broaching the holes in piston pins, spring eyes, rocker arm bushings, connecting rod main bearings, and king bolt holes in axles. A set of tools like this should pay for itself many times over in a short time.

The operation of broaching the wristpin bushings in a piston is illustrated in Fig. 7. The piston is held in

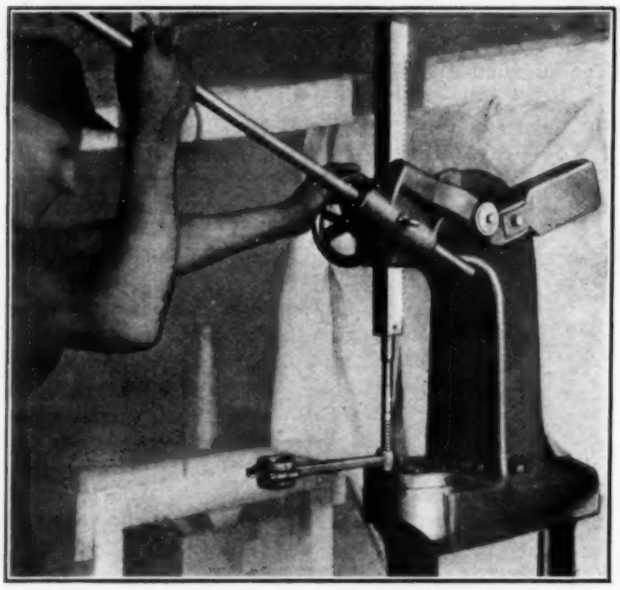


FIG. 5—BROACHING A WRIST-PIN BUSHING

a jig which closes about the entire outside surface of the piston, thus precluding the possibility of the piston's being distorted while the operation is in process. The pin hole is aligned with the hole in the jig so that the broach can be started, then the clamping screw is

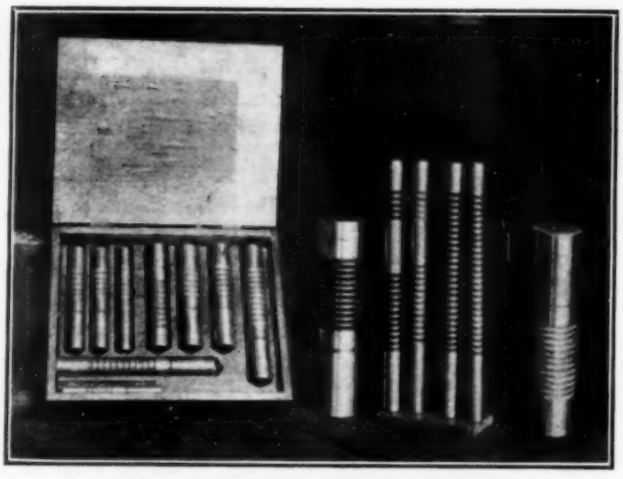


FIG. 6—SET OF SHELDON BROACHES

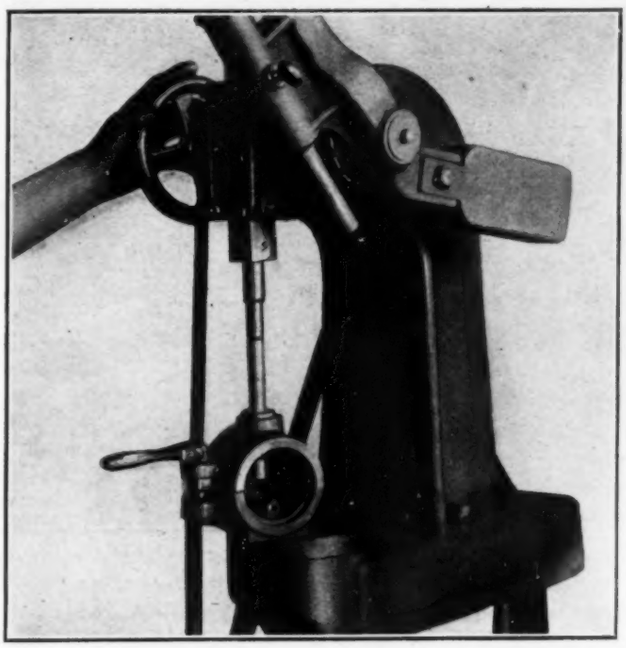


FIG. 7—BROACHING WRIST-PIN HOLE IN PISTON

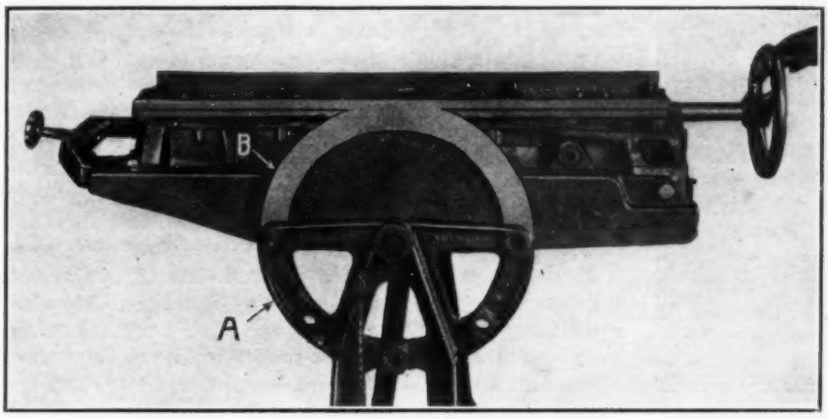


FIG. 8—MOTOR STAND AND ALIGN-BORING TOOL

tightened down and the broaching operation proceeds.

A crankcase in position to have the main bearings reamed is shown in Fig. 8. The case is held in a motor stand that is built especially for Buick motors by the Service Station Equipment Co., Chicago, Ill. The stand is designed to take all models of Buick motors with four and six-cylinders, and a motor can be completely disassembled and assembled without removing it from the stand. The section to which the case is bolted is held in position by a plug which slips through one of the holes in the circular section *A* and into a corresponding hole in the section *B*. The five holes in section *A* make it possible to hold the case at practically any angle.

The boring fixture consists of an iron frame that carries the boring bar and a shaft that slips through the camshaft bearings. Locating from the camshaft hole insures that the cam and crank gears will be the correct distance apart, and that the crankshaft will be perfectly aligned. The boring bar has a 32-P thread on the opposite end from the handwheel and a split, hinged nut is attached to the frame so that it can be locked around the thread on the bar. Thus turning the handwheel feeds the bar $\frac{1}{32}$ in. per revolution. A boring tool, made of a bit of $\frac{3}{8}$ round high-speed steel protrudes from a hole in the bar at each bearing. Adjusting and clamping screws hold the tool-bit in position. When the tool is in position, turning the handwheel feeds the bar through and bores out the bearings. With this tool a case can be align-bored, "floor to floor," in from $1\frac{1}{2}$ to 2 hours.

The set-up for honing out a cylinder bore, using a home-made honing tool, is shown in Fig. 9. The tool, Fig. 10, is made of maple-wood with five slots milled in the sides for a set of abrasive stones. Three $\frac{3}{8}$x$\frac{3}{4}$-in. coil springs under each stone force the stones against the wall of the cylinder. The tool is turned smaller in diameter at one end, a wire about the tool at this point holding the stones to the tool when not in use. In the upper end of the tool is a short section of steel shaft that has been split and pinned to a similar section so as to form a universal joint. The tool is held in a chuck in a drill press spindle as shown and worked up and down in the cylinder bore while revolving. High spots, rough spots and taper up to 0.005 in. are removed with the tool, the time required averaging about 6 min. per cylinder. The cylinders are tested with a Walker Microgage after honing.

FIG. 10—HOME-MADE HONING TOOL

The operator shown in Fig. 11 is

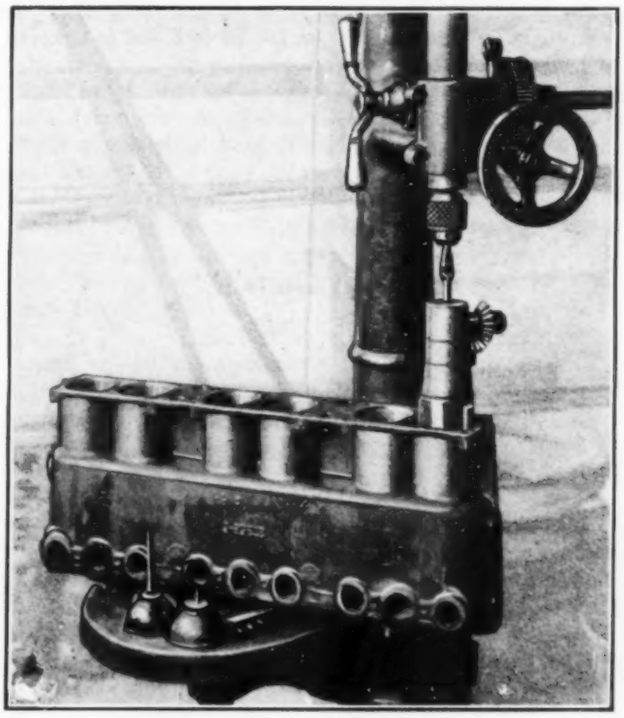


FIG. 9—HONING A CYLINDER BORE

working on an axle that is held in a "Dixie" axle-stand, made by the Service Station Equipment Co., Chicago, Ill. The stand can be used for either front or rear axles, the extension framework serving to support the propeller shaft. The stand is equipped with two vises, one tipping to the side to make the axle housing accessible for the removal of the roller-bearing sleeve, and the other turning on a spindle to facilitate the removal of the differential and axle shaft. A heavy cast-iron removable pan is provided to catch the grease and oil from the differential. The extension framework can be folded when not in use.

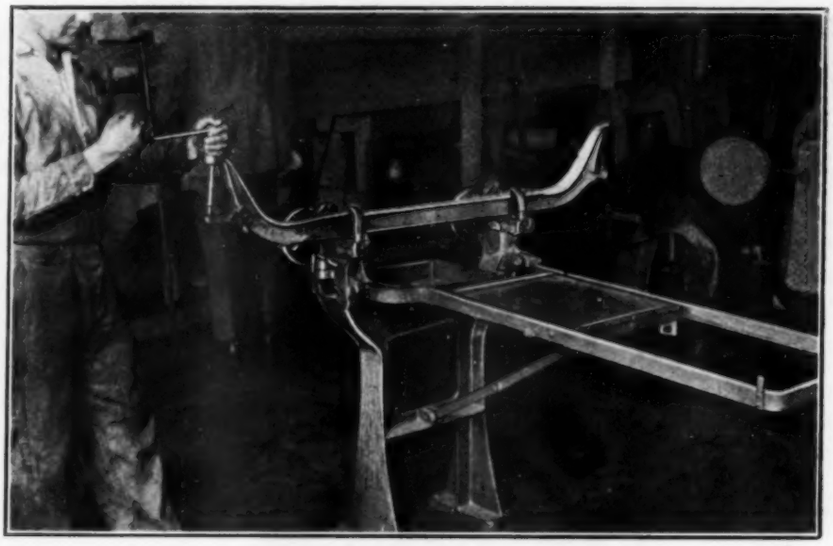


FIG. 11—USING THE "DIXIE" AXLE-STAND

In a former article a carbon-burning outfit was described that included a storage battery to supply the spark for ignition. A similar idea is illustrated in Fig. 12, except that no battery is used. The left-hand of the operator is holding a worn out hacksaw blade that is connected by 30 in. of wire to the rear end of the gas torch. When the operator is ready to begin, he inserts the torch into the spark-plug hole, turns on the gas, then touches the hacksaw blade to the strap between the battery and the generator. Rubbing the end of the nozzle on the threads in the hole will cause sparks to fly and the gas will be ignited.

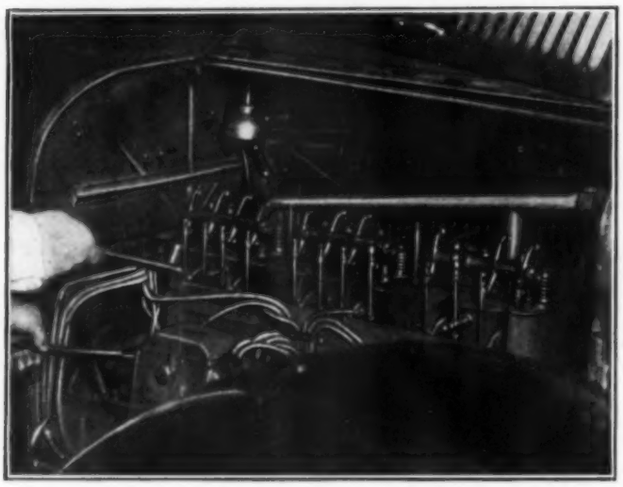


FIG. 12—IGNITING GAS FROM BATTERY STRAP

The Four Hour Day

BY ENTROPY

It seems that we are all to work on as little as a four hour day in 2023. To some of us who have put in quite a little time on this earth that seems a long time to wait. Why not have it now? Then again, on second thought, haven't we it now?

Every little while I go somewhere and see people who are working, that is, they draw wages, salaries and so on. Sometimes I see them working, sometimes they seem to be resting, at other times there are indications that they are thinking.

In this building there is a gang of men who are altering it, and they represent all the building trades. They are said to draw wages that a few years ago would have been considered princely. They work indoors, they are sheltered from the weather, they get in full time day after day and week after week. They are present forty hours a week, but if they were docked for all the time they spend making remarks about passers-by, borrowing a match and the makings, and knotting their brows in despair over blueprints, they would draw no more money than their predecessors of thirty years ago.

I go into a machine shop occasionally where the same thing prevails, only I think they think they work a nine hour day, but if they were paid for the time they keep their machines running, which is all the time they are producing, they likewise would have small pay envelopes.

Much observation makes me believe that we struck the four hour day, except in a limited number of cases, some years ago. Where there are piece-work hogs, who would work away up to ten hours a day if they were allowed to do it, there is considerable activity, but the day or hour workers seem to have adopted a standard of their own that is not far from the four hours which Dr. Steinmetz suggests for a century to come.

Even my professional friends delight in conferences. A conference, so far as I am able to discover from attending them most of my waking hours for several years, is a place where from three to thirty men smoke, tell stories, have a sociable time and ultimately do what one man decided they would do before the conference was called. A conference is a sop to a sort of responsibility-sharing complex which keeps us from being willing to take the bull by the horns and solve our own problems. The average working day for us conference attenders averages about one hour.

Now, why not all hands join at once in throwing off the camouflage, and admit that we do not work much and then cut the real working day in halves. We do not need tell our families what we have done. We will work, and work like real workers every morning, and then in the afternoon we will play. We will get a great deal more done than we do now mixing the two.

Of course there will be an occasional work-hog that will work with the rest of us mornings and cut the afternoon session and go run a business of his own, but that has always happened, and they are welcome to their hard earned profits. The rest of us don't need the money. We make enough the way it is.

The Worker's First Training

By O. C. Richards

USUALLY we think of the worker's training as starting when he is hired into the shop and placed under the supervision of an instructor. The object is, of course, to obtain an efficient and reliable worker who will be likely to continue in our service a reasonable length of time. After using all the care possible in instruction, the results shown in different instances vary so much that we are daily impressed with the importance to us of the training that the boys have received in the home and school.

Not long since I was asked to assist in obtaining a job for a young man of my acquaintance. I have known this boy and his home surroundings and training all his life, and I flatly refused to speak a good word to any prospective employer. I am positive that he will not stick with any job. He has never learned self control and has been taught to think that he has very unusual natural ability, which is not at all according to the facts in the case.

There are many such boys coming under the observation of all of us. It will take a good many hard knocks to teach them the value of dilligence and hard work, and many of them will learn it too late to be of the greatest value to them. As I look about me in the shop I cannot help being impressed with the questionable fitness of many of the parents I see, for the responsibility of training children in the proper ideals of citizenship.

The hopelessly ignorant man is at a big disadvantage, and it seems that there is surely no excuse at this day for parents allowing a child to grow up without at least the rudiments of an education. Such a man is the prey for all the propaganda of the unscrupulous, and it is astonishing what ideas such people sometimes get. During the recent hard times a man of middle age came to me one evening at quitting time, white and trembling with anger, to tell me that he was leaving. Some one had jokingly said to him "You are a jinx. You are helping to bring hard times." He had taken all this in dead earnest and, it had so preyed on his mind that he thought all the boys were against him and wanted him to quit. I found it very difficult to disabuse his mind of this trouble. The ignorant and uneducated man can never be more than what the Scripture calls a "hewer of wood and a drawer of water," and the responsibility rests very largely with the parents who failed to give him the advantages he should have had.

Need Courtesy and Cheerfulness

Just plain lack of courtesy is exceedingly annoying to contend with. Many times I see a workman step up to his foreman when the latter is in the midst of a conversation, and interrupt him in regard to some trivial matter. Whenever I witness such an occurrence I feel that I have had a good glimpse of that man's real character. There are thousands of opportunities for the display of courtesy in our life about the shop, and it does much to keep us all happy when our associates treat us with consideration.

The grouch is a regular institution in all our shops. He cannot seem to get the idea of what he is missing by rubbing people the wrong way. I have a very good friend who is of that type. He is a shop foreman, and is an interesting conversationalist on account of his wit and his fondness for a joke. When he reaches the shop his disposition changes entirely, and his men see the grouchy side of his character.

Another man is a lathe operator on a particular line of work. If he is assigned a job that is a little different and out of his line, he immediately starts to find trouble with the job so that he can get it placed on day work or given to another operator. Under these circumstances he worries the foreman nearly distracted, yet he claims to be a very expert workman.

A political or religious fanatic makes a deal of trouble some times. He is never content to think his own way and let others think theirs, but must constantly antagonize his associates and pour into their ears his distorted ideas of life. Such a man is often really anarchistic in his views and does a great deal of harm among a certain class. I once had such a man as an instructor. He had been given the job through somebody's poor judgment, as a reward for service. It proved that his complainings against the shop conditions were the direct cause of many new men leaving. They did not know that his complaints were just as bitter against almost any existing condition in the entire country. He is now where his long experience is of value to the company, while his tongue can do very little damage.

Character the Main Consideration

Honesty is an old fashioned virtue and should be much more common than it is in some places. There seems to be a sort of a double standard existing in many people's minds. A man was recently overpaid nearly thirty dollars and said nothing about it until the office found the mistake. The same man has been known to quibble about a time allowance that others accept without comment. It is not hard to connect some of these things with the parent insisting to the conductor that Johnny is only nine years old, but large for his age.

There is the man who is anxious to have the boss think that he cannot handle a certain class of work. He will even sometimes spoil a piece purposely to help out his argument. This action he hopes will result in his being kept on the simpler work that he is used to, and which does not require the mental effort. Also, he thinks that if he is considered capable of handling the more difficult work, he may have occasional special work with time allowances not as yet set. I know many of this type, both male and female. I have in my library a book entitled "Poor Boys Who Became Famous." I sometimes wonder how such actions would appear to the heroes of these tales.

A boy of eighteen walked up to his foreman and said, "Fire me. I want to get my money so that I can go to another city." When told that he would have to get his money on the regular pay day or give the customary number of days notice before quitting, he was very much put out. Lighting a cigaratte, he blew the smoke in the foreman's face and said, "Now I guess you will fire me, all right." Reputation means nothing to such a man. The good opinion of others seem to be of absolutely no value in his estimation.

In the few instances and types described, it is easy to see the part that early training has played in the habits and character of our associates in the shop. The child reared in a good home and taught the essentials of good character, has a big start toward success. I am always delighted when I can get hold of a young man or woman whose early training I know to be good.

A few months ago it was necessary to pick a foreman for a certain department. There were several who

were familiar with the work and possessed many of the qualifications needed. The choice fell along the lines of character. The man appointed did not have as wide experience as some other candidates, but was of such obvious strength of character as to overbalance some other weaknesses. His courtesy, honesty and self control had not been acquired in his mature years, but had been diligently taught in childhood by those responsible for the training of the child. Whatever our children are to engage in when grown, the finest thing we can do for them and for our country, is to teach them the principles of real character, as well as give them the best educational advantages circumstances will permit.

Promoting American Machinery Sales Abroad

By W. H. Rastall
Chief, Industrial Machinery Division, Department of Commerce

NO CAMPAIGN for foreign business should be started until the necessary domestic organization has been developed. Instances have been known where firms have actively advertised in foreign countries and later, when confronted with an export order, did not know how to execute it. Such methods are inexcusable and discredit the manufacturer at home and abroad. Export business is good business and worth sustained effort. Some large American firms depend almost entirely upon their foreign business. It has been shown that the average American machinery manufacturer exports 17 per cent of his product. Also this business can be secured on terms that are clean and attractive, but to sell without proper preparation is only to sell trouble.

Neglect of foreign customers, bungling methods, in fact all of the long list of export sins accumulate "bad will" against the day when a serious effort is to be made. Also these failures create a handicap for other Americans who are overseas. Manufacturers should keep out of foreign trade until prepared to handle it properly. These remarks should not be interpreted to mean that foreign trade is difficult, for properly approached, it is easily handled and clean business, and Americans can handle the trade as well as anyone else, as is demonstrated by the volume of our machinery sales abroad.

It is important that a definite foreign sales policy be established. This policy may not be the same for the varying conditions of different territories, but in each case it should be definitely decided whether the manufacturer will quote only f. o. b. works, f. a. s. New York (or other port), or c. i. f. destination; whether he will open a branch, send his own salesman, grant an exclusive agency, or operate in an open market, etc.

Selecting a Representative

Unquestionably the best way to select an agent is to gather all possible information in the United States and then visit the foreign country, investigating the matter and coming to an agreement on the spot. When conditions justify, this should be done, but if attempted it should be done properly. It is a great mistake to feel that it is possible to rush into a foreign country, acquire the necessary information, make a decision, and hurry on in a short time. Furthermore, each country has its own peculiarities, so that it is scarcely safe to draw conclusions from one with respect to another. Each constitutes a separate sales problem.

The matter of covering the territory adequately is very important. Many of our people use the political boundaries, thinking that they mark out the business districts. This is a great, though common, mistake. The fact that a firm has an office in Shanghai is no proof that it can cover properly the Hongkong or the Peking districts. In point of time Peking is as far from Shanghai as Salt Lake City is from New York. Very often a Calcutta firm is not prepare to cover either Burma or Bombay.

When arranging for the appointment of an agent, the manufacturer should also arrange for such supervision of this agent as is necessary to protect and promote the interests of the manufacturer. There are many ways by which this can be done. More and more the better merchants and manufacturers are arranging to have a qualified salesman (really sales manager) join the staff of the agent in each important foreign office. The details of the arrangement vary a great deal, but the plan is very effective where circumstances make it practical, and it overcomes many difficulties. An alternative method is to have this man travel to supervise a number of offices—an arrangement that has been used a good deal in the automobile trade.

Choosing the Man to Send

If a man is to be sent abroad, extreme care should be exercised in making the selection. A good man can accomplish a great deal. A poor selection is very expensive, not only because of the way the representative spends money but also in the effect upon the reputation of his company.

In foreign countries a special representative of a manufacturer occupies a position of real importance, corresponding somewhat to that of a branch-office manager at home, except that he has greater responsibilities. He is in competition with the whole world. He is thrown into intimate contact with all sorts of people and must maintain his position and adequately represent the interests of his principals at all times. He must be equal to any emergency. If anyone makes a mistake, whether in the home office, in the factory, or on the 5,000 or 10,000 mile line to the ultimate buyer, this man must "absorb the shock," rise above all complications, and handle the matter in a creditable way. He is a "business ambassador" and should not be sent unless he knows his business, his line, and is loyal to the interests of his principals, with confidence in their products and organization. The American engineering salesman abroad sells more than an individual machine or even a complete factory. He sells the American way of doing things; his machines will not prove to be a real success unless they are operated in the American way, and the American way differs from the way most familiar to Europeans, natives, etc.

Of what value is automatic machinery unless it produces a standardized product? Why have a standardized product unless interchangeability is important? Through quantity production, inventiveness, and clear thinking American engineering has been raised to a position that is in advance of all others, and it requires men who are thoroughly familiar with these American methods and ideas to properly represent American goods abroad.

Excerpts from Trade Information Bulletin No. 138, Department of Commerce.

It Pays to Replace—

How a Shop Saved by Replacing Old Shop Equipment with New Equipment

These articles won honorable mention

By W. DeWitt Leinbach
Milton Machine Works, Milton, Pa.

THERE is no spot in the whole realm of machine shop activity where replacement would better pay, if judiciously carried out, than in the general jobbing shop. Yet strange to say, such shops are the very institutions where it is the hardest to make the management see why a replacement pays in real dollars and cents.

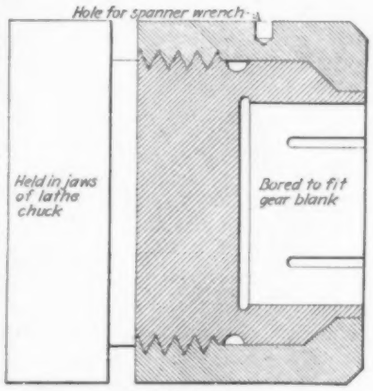
An improved machine may be O. K. and its special features may meet with approval, but the "straw that breaks the camel's back" is generally the query, "Why should I replace the old machine with a new one when the old one answers the purpose? True, the old machine has no quick change gears, no compound rest, no power cross feed, but why do I need them? This is a jobbing shop. Suppose a job does take fifteen minutes longer without these conveniences? I get paid for that time anyway and the customer doesn't feel it, so why should I invest $1,500 to $2,000 in a new machine."

It is because the writer has heard such an argument advanced, and knows the result, that this article is written especially about replacement in a job shop.

War Brings Business

During the war period everybody was rushed to capacity. All the silk mills, woolen factories and brick plants, that generally had their jobbing done in larger shops, started swinging things our way, as the larger shops were tied up with government contracts. One bright morning in May, a salesman talked to the boss about lathes. The boss knew we needed another lathe, but had figured on purchasing a second-hand one. It happened that I was called in the office that particular morning and I could see the boss was partly sold on the proposition but couldn't be convinced of the investment. When, however, the salesman made an offer of liberal time payments, I pushed on the accelerator and before noon an order was signed for a 16-in. swing 12-ft. bed, up-to-date Rockford Economy lathe with all attachments. When the machine arrived, I don't believe any father could have been prouder over the arrival of a new born son, than was the boss when the crating was removed and the new lathe shone forth in all its glory, through its copious coating of grease. One of the workmen jestingly remarked that he would have to wear kid gloves if he wanted to work on it and hold his job. "Oh, yes," the boss remarked when I quizzed him about his new purchase, "It's a nice machine all right but now comes the paying for it. I'll say yet, I could have bought one like that" (pointing to a lathe, in fair condition, but old style; no compound rest; no taper attachment or power cross-feed) "and be $1,000 in pocket. It would do all our work and I'd have that $1,000 to invest in something else."

The new lathe was installed in due time in one of the best locations in the shop, and it was decreed from headquarters that only the very best of work was to be done thereon. The first few months it was kept busy on such work as making brass bushings for electric motors, boring boxes for the transit company's journals, truing and balancing wood working planer heads, and all of the finer and more accurate type of work to be found in a jobbing shop. Quite a saving of time was noted, but not enough to overcome the prejudice to the investment on one tool.



CHUCK FOR HOLDING GEAR BLANKS

Up to this time our shop had been almost completely confined to strictly jobbing work but occasionally some of the larger plants around our section would throw in our way the overflow of their shops, which was always done on an hourly rate. Several requests came for larger orders, but these required piece work bidding, and that the boss was afraid to tackle.

About four months after the new lathe was installed, the local silk company came to us with a request to make one hundred and fifty steel pinions, 10 D. P., 18 teeth; 1¼ in. width of face; hole tapering from ⅜ to ⅝ in.; 7/16 in. keyway ⅛ in. deep, but they wanted a quotation beforehand. Here was a new state of affairs for the boss. He wanted the business, for he knew he now had the cream of all the silk company's work. They had never complained as to price on our other work and he knew, wisely enough, if they went elsewhere for this little order, it might be the beginning of the end of a perfect day.

At my suggestion he wrote a large concern in the gear business for a quotation, with the expectation of placing the order and furnishing the gears to the silk company at actual cost to us. The quotation came in due time at $1.20 each, but shipment could not be made short of 60 days.

We notified the silk company, only to find that they, too, evidently had written elsewhere with similar results. Time was more of a factor to them than money, as 150 large looms were tied up until they secured these gears.

Overnight I did some tall thinking and planning. Next morning, I went to the boss with the proposition that if he would let me have my own way, give me the use of the apprentice boy and the new lathe, I would have all the gears ready for cutting; at least half of them cut, and perhaps all, by the end of that week. It was then Tuesday and we didn't work Saturday afternoon. After a little deliberation it was agreed that I go ahead if our bid was accepted. What quotation was made I do not know, but we got the business and the silk company had the new looms running the following Monday.

Putting the New Lathe to Work

Here comes the part the new lathe had in the affair. I started just as soon as the order was confirmed Tuesday afternoon. I got shafting from the stock room the exact outside diameter for the blanks, and started the apprentice boy cutting it up into proper lengths on an Atkin's "Kwik-Kut" power hacksaw, which did the work with remarkable speed and accuracy. The drill press was right near the saw, so I got him to rough drill the blanks and run the saw at the same time. Meanwhile, I used the new lathe to make the chuck shown in the illustration, also a taper plug gage and a mandrel for cutting the gears on our antiquated milling machine.

By the time I had this special equipment made, the boy had a goodly number of blanks for me to bore and face. The boring and facing was a pleasure on that lathe. By use of the chuck, a blank was brought true by simply tightening the sleeve with a spanner wrench.

A blank was placed far enough in the chuck so, that by the time one side was faced, it was flush with the edge of the chuck. This brought each blank in the same relation to the taper attachment. Then, with the taper attachment properly set, the taper hole was bored to fit the plug gage accurately. The new lathe, with its attachments and graduated dial on cross tool feed, enabled me to do accurate work at a tremendous saving of time. After I had been well started on boring and facing the blanks, the apprentice boy was ready for something else to do, so I got him started on the keyseating operation, which, due to lack of proper equipment, consumed more time than should have been necessary. After keyseating, it was only necessary to face the other side of the blanks and they were ready for cutting. The apprentice boy did all the cutting which consumed several days' time.

Savings on the Job

In rating the apprentice boy's time and my time at the charges then made on general job work, I found we were producing these gears about 8 cents cheaper each than the quotation from the larger shop in which gear making was a specialty. Had we been equipped with more modern machinery the price would have been materially reduced.

When the job was finished and the gears delivered and paid for, the boss dropped the remark that he wished we could get more of that kind of work. Then was my time to strike home an argument for new tools to replace some of the old ones so we could bid on such work and make out well on it. In due course of time a new milling machine was purchased and now the little shop is doing a neat side line of manufacturing which works in admirably well with the jobbing business and tends to stabilize our working force.

By Albert Reich
Efficiency Engineer, Nash Motors Co., Kenosha, Wis.

THIS particular analysis pertains to labor costs on some of the operations on a crankshaft for a six-cylinder motor.

For convenience the operations have been grouped as follows:

1. Finish turn outside diameter of flange. Face flange. Finish turn oil sling.
2. Drill 1-in. hole. Drill 1⅛-in. hole.
3. Bore, ream and center.
4. Finish face gear end. Turn grooves and cut to length. Re-center and cut threads.

All operations were done on ordinary engine lathes, 8 lathes being required. The labor cost per hundred shafts was as follows:

Operation 1, $6. Operation 2, $3.50. Operation 3, $5.50. Operation 4, $7.50. A total of $22.50.

Operations 1, 2, and 3, as shown in Fig. 1, are now

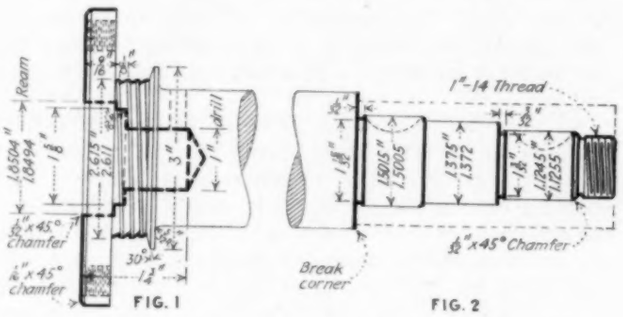


FIG. 1—OPERATIONS 1, 2 AND 3. FIG. 2—OPERATION 4.

done on three Warner & Swasey special heavy-duty turret lathes, equipped with constant-speed motor drives and special tooling. The labor cost is $12 as against $15 by the old method.

Operation 4, as shown in Fig. 2, is now done on the same kind and make of machine equipped with special tools and a Landis die for threading. The labor cost is $4.50 as against $7.50 by the old method.

It will be seen that four improved machines are doing the same work as eight old ones at a saving in labor cost of $6 per hundred shafts or a saving of 26⅔ per cent. Besides saving in labor paid for actual machine work, there is a saving in handling the shafts, in floor space, and maintenance that is well worth the attention of a management which understands the value of many small savings.

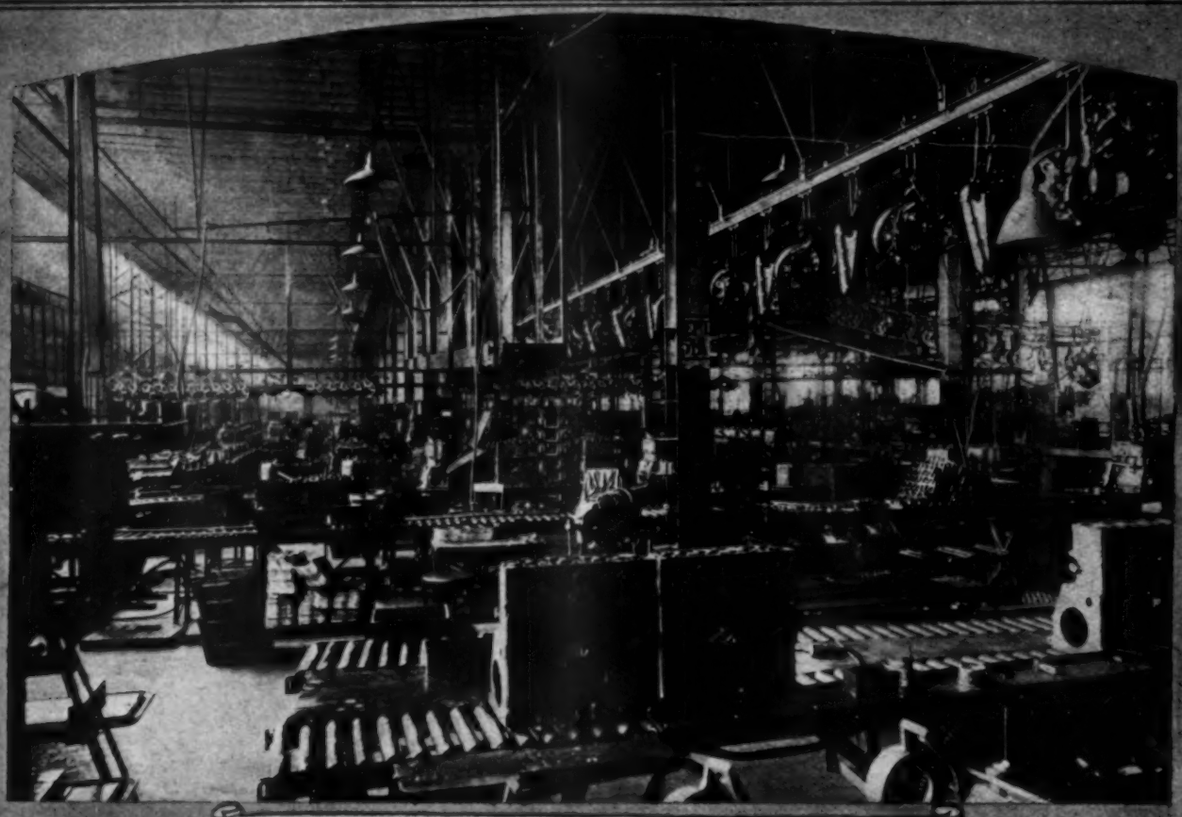
By W. F. Johnson
Asst. Foreman Repair Shop The Helderberg Cement Co., Howes Cave, N. Y.

IN A REPAIR shop for a portland cement company we have about 6,000 running ft. of boiler iron to cut per year for repairs. The thickness runs from ¼ to ⅝ in. While making a repair on the shell of a kiln, it means that production is stopped on the kiln, a matter of 1,700 bbl. per 24 hr. or about 70 bbl. per hour. To cut a patch for the shell of a kiln 5 ft. long, takes four men with cold chisels and sledges 2 hr. or a total time of 8 hr. To cut the same patch with an oxy-acetylene outfit, with Davis-Bournonville cutting torch and one man, takes 15 min. This is just one illustration of the saving that can be made by the use of modern equipment.

Where Machine Tools Are Made

Brown & Sharpe Manufacturing Company

Founded 1833

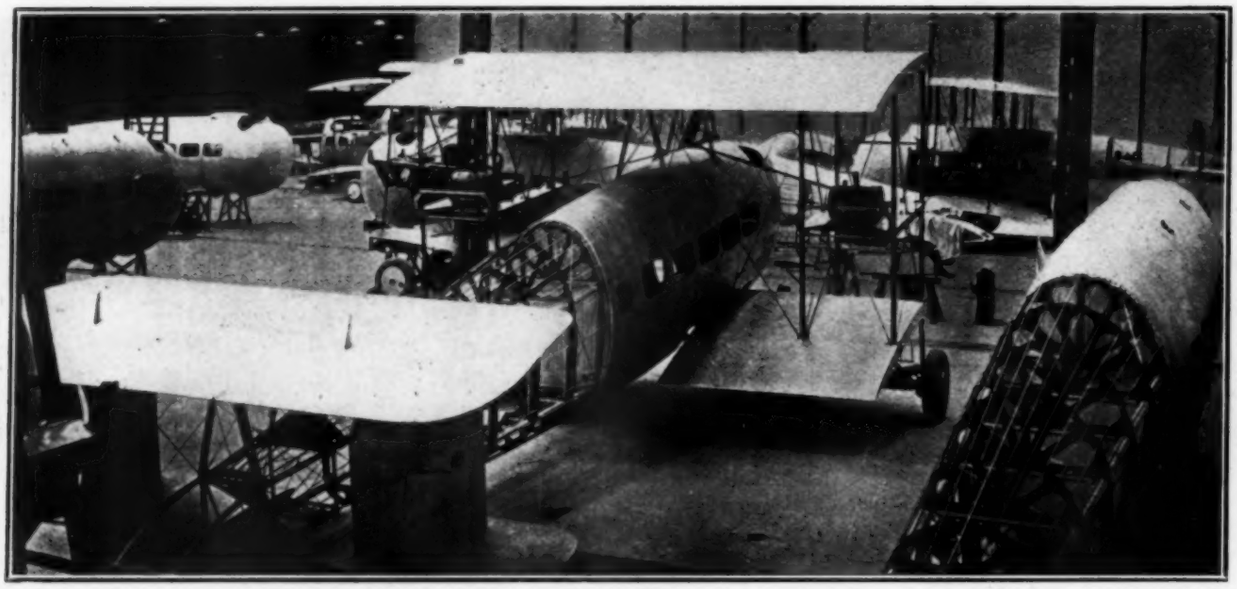


Accelerating automobile assembly

Rollers and monorails above, chain track below

Methods of various shops

Side rail jacks and rotating suspended carriers



Machinery of the Air

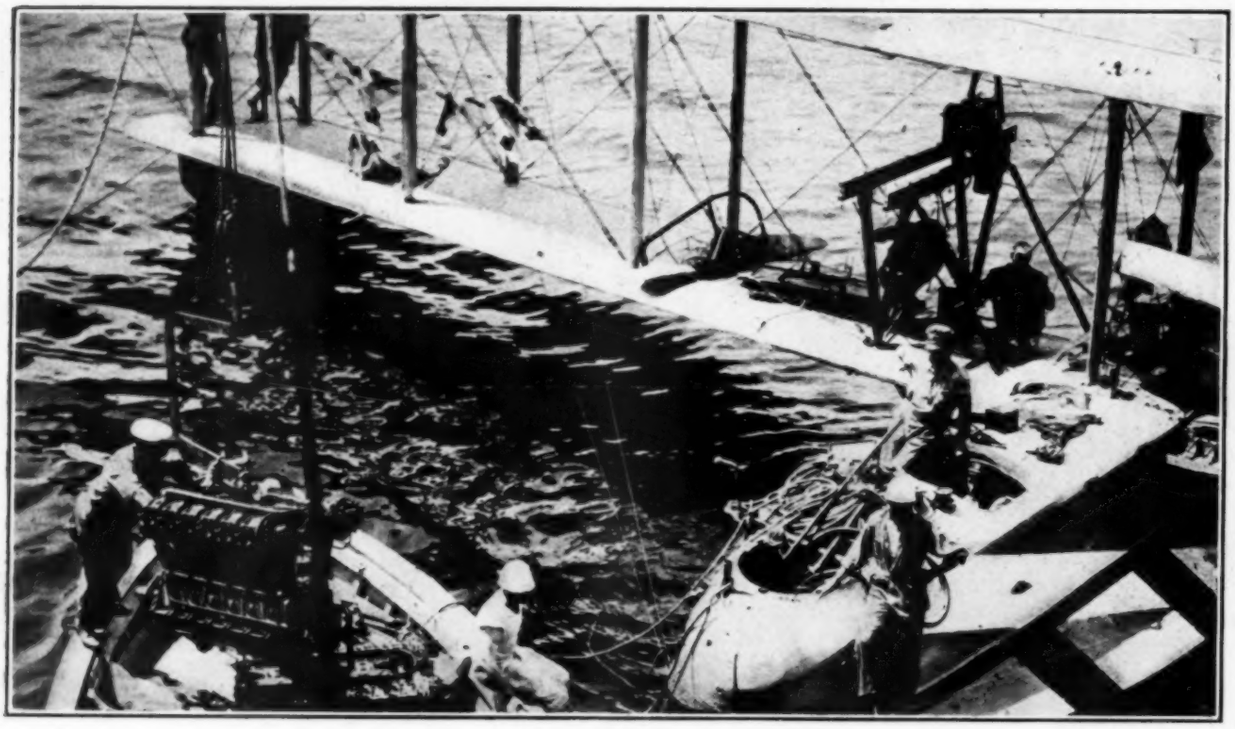
Will it be the occasion for the next boom in the machine tool field?

Above—Building commercial airplanes for China at the Vickers Works in England

Left—A homemade rescue sled for seaplanes. It draws 8 inches

Below—Transferring a Liberty motor at sea

Photos by Kadel & Herbert, N. Y.



The New Screw Thread Standard—III

By RALPH E. FLANDERS
General Manager, Jones & Lamson Machine Co.

Discussion of report on screw thread standards adopted by the A.E.S.C.—Fine and coarse-thread series—Numbered and fractional sizes of screws—Elimination of unnecessary threads

CONTINUING the report on screw thread standards recently made by the American Engineering Standards Committee, we come next to the section entitled:

III—THREAD SERIES ADOPTED

Two thread series are adopted—a coarse and a fine. The Coarse-Thread Series is the present "United States Standard" supplemented in the sizes below ¼ in. by the standard established by the American Society of Mechanical Engineers (A.S.M.E.). The Fine-Thread Series (¼ to 1½ in., inclusive) is in accordance with the present "Regular Screw-Thread Series of the S.A.E. Standard for Screw Threads" established by the Society of Automotive Engineers (S.A.E.), supplemented in sizes below ¼ in. by the Fine-Thread Series established by the American Society of Mechanical Engineers. (A.S.M.E.)

These two series are specified in Table I.

The only points which need to be raised here in connection with the thread series relate to the numbered sizes. Until the work of the Machine Screw Standard Committee of the A.S.M.E. these threads were in unutterable confusion. There was diagreement as to the basic pitch diameter of a given size. There were usually three and sometimes more pitches for each diameter. This fact, combined with the wide variety of heads and lengths, ran the number of varieties which had to be carried in stock up into the thousands. The reduction of the pitch diameter to a standard, the standardization on two thread series now accomplished, and the straightening out of the head-form situation now in progress by another A.E.S.C. Sectional Committee, will greatly reduce these thousands of varieties, with a corresponding advantage to the consumer in quality, uniformity, price and promptness of delivery.

The first pitch series set by the A.S.M.E. Committee was the present Fine-Thread Series for the numbered sizes. This standard failed of universal adoption owing to its being finer than the average range of work in common use. A second step was therefore taken in the selection of a number of alternative coarser pitches as permissive where the fine pitches were not considered practical. This plan was found to be unsatisfactory, however, as the majority of threaded products was scattered over this wide range, resulting in a condition that was not standardization in any sense. The final and necessary step was then taken of selecting a definite coarse-thread range, which is that here given for the numbered sizes.

At only one point does this series depart from what was found to be the average of commercial practice. This exception is in the case of the No. 4 thread in the coarse series, where 36 was the pitch most commonly used. But, since the larger No. 5 thread was commonly given a finer pitch—40—practice in this respect seemed to be quite illogical and practically at fault, so that there was no hesitation in calling for a radical change in this particular, giving the No. 4 thread a pitch of 40 also.

These two thread series have been approved by the leading machine screw manufacturers of the country. Their approval carries with it the further change of discontinuing the numbered sizes larger than No. 12,

TABLE I—THE TWO THREAD SERIES ADOPTED

1	2	3	4
Identification	Basic Major Diameter	Fine Series. Threads per Inch	Coarse Series. Threads per Inch
0	0.060	80	..
1	0.073	72	64
2	0.086	64	56
3	0.099	56	48
4	0.112	48	40
5	0.125	44	40
6	0.138	40	32
8	0.164	36	32
10	0.190	32	24
12	0.216	28	24
¼	0.2500	28	20
5/16	0.3125	24	18
⅜	0.3750	24	16
7/16	0.4375	20	14
½	0.5000	20	13
9/16	0.5625	18	12
⅝	0.6250	18	11
¾	0.7500	16	10
⅞	0.8750	14	9
1	1.0000	14	8
1⅛	1.125	12	7
1¼	1.250	12	7
1⅜	1.500	12	6
1¾	1.750	12*	5
2	2.000	12*	4½
2¼	2.250	12*	4½
2½	2.500	12*	4
2¾	2.750	12*	4
3	3.000	10*	4

* Note:—These pitches are suitable for work requiring short engagement where it is not practical to specify tolerances for all conditions. They are not therefore included in the succeeding tables.

and following the fractional sizes from and including ¼ in., as given in the table.

While screws of both series are listed by all machine screw manufacturers and both series are carried in stock by most of them, the greater demand in the numbered sizes is for the coarse-thread series. No. 10-32 is the most used of the fine series.

The diagram given in Fig. 8 shows the degree of smoothness and continuity in the two series through the numbered sizes and up to ¾ in. in the fractional

sizes. The diagram is so made that if the pitches were in strict proportion to the diameter, the line for a thread series would be a straight line radiating from point *O*. There are obvious reasons for making the pitches coarser in proportion as the size diminishes, as will be touched on with more particularity later on. This is evidently done for the sizes above ¼ in., where the general direction of the lines for both series is toward a point considerably above point *O*. The series for the numbered sizes give pitches more nearly proportional to the diameter, and the lines in this part of the diagram tend to converge on point *O*. Thus, there are

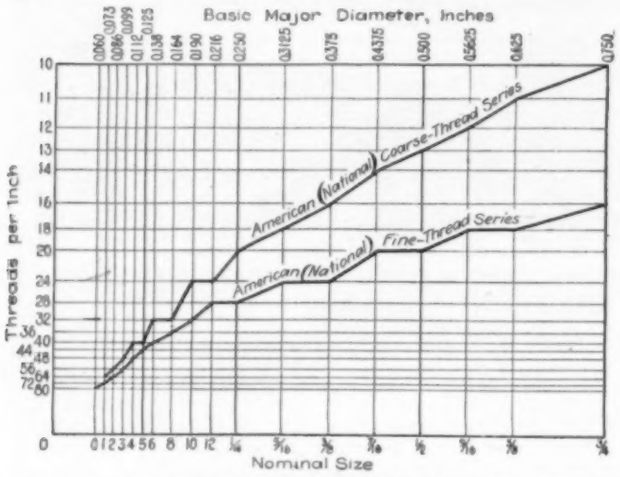


FIG. 8—DIAGRAM OF COARSE- AND FINE-THREAD SERIES ADOPTED IN A.E.S.C. REPORT

really two separate thread series, separately developed, which coincide at the ¼-in. size. There is no real objection to this situation, since both series in both the numbered and fractionel sizes have been proved satisfactory in practice, and the diagram indicates that there is no abrupt break.

The note at the foot of Table I, applying to the Fine-Thread Series for 1¾ in. and larger, should be carefully observed. The Sectional Committee took the ground that their report should apply to "standard screw threads for bolts, machine screws, nuts, commercial tapped holes, etc." In other words, it applies specifically to work in which the length of engagement will probably equal the diameter. If the Fine-Thread Series is to be used for this length of engagement throughout its range, the pitch should be proportionately increased above 1½ in. instead of remaining unchanged up to 3 in., as it now does. The close tolerances applying to this fine 12-pitch do not allow leeway enough for inevitable lead variations on the long engagements demanded by standard bolt and nut work. Hence the reservation given in the note.

The fine pitches above 1½ in. are, of course, available for special short-engagement work, such as thin retaining nuts, bearing cups and hub caps. The pitches are therefore given for reference. But if in the future it becomes advisable to extend the Fine-Thread Series for standard bolt and nut work, the pitches for diameters above 1½ in. will have to be reconsidered.

Another feature was a result of thus confining the standard. The original U.S.S. thread provided sizes by ⅛-in. steps up to 2 in., by ¼-in. up to 4 in., and by ½-in. up to 6 in. General practice has eliminated many of these sizes, more recent tables showing sizes by ⅛-in. steps up to 1 in. and by ¼-in. steps from there to 2 in. A still further reduction has been made in this report, eliminating the 1⅛, 1⅜, 1⅝, 1⅞ and 1¾ in. sizes.

For miscellaneous threaded parts these omitted sizes might be required; but for standard bolt, screw and nut work the sizes retained would seem to give satisfactory gradations and range. This simplification will permit a considerable reduction in bolts, screws and nuts carried in stock, as well as in stock taps, dies, gages and the like.

This article is the last of the introductory chapters. The next installment will contain the tables of dimensions and tolerances which define the new standard.

Old Hay Press with Hand-Cut Wooden Screw—Discussion

BY JOHN JAMES GRANT

The article by H. E. Crawford, under the title given above, on page 706, Vol. 58, of the *American Machinist*, reminds me of an old wooden screw I found in 1864. I was making some repairs at a factory in East Hampton, Mass., and during a stroll one evening, I found under a shed an old press that had lain there many years. Upon inquiry I found that the press was about 70 years old and had been built for pressing cheese.

I bought it for ten dollars, delivered to my shop in Northampton, and used it for pressing the plastic material into molds for making solid emery wheels. I had received the right to make the Marshall emery wheels, one of the first solid emery wheels invented and afterwards made by the Northampton Emery Wheel Co., Leeds, Massachusetts.

The man from whom I bought the press told me he had seen it made and had watched the process of making the screw and nut very closely.

The press, including the screw and nut, was made of beech wood and was a fine piece of workmanship. The screw was about 6 ft. long and 6 in. in diameter. The head was about 12 in. in diameter and 8 in. long and was reduced to about 11 in. in diameter at each end to receive two bands of iron 2 in. wide, and two holes were bored through at right angles to each other to receive the bars for operating the screw. The lead of the screw was 2 in. and the threads had an included angle of about 90 deg. and were flatted to about ⅛ in. on top.

A fine line was marked around the screw blank while it was in the lathe, at the point where the threads were to start. Then a piece of heavy paper, of a length equal to the circumference of the screw, was cut diagonally from 2 in. at one end to a point at the other end. A line scribed against the diagonal edge of the paper furnished a guide for the lead of the screw. A set of carpenter's tools and good workmanship did the rest for the screw.

Making the nut was easy as it was a cut and try job. It was made in halves and by running the halves back and forth on the screw, the threads, both on the screw and in the nut, were corrected to a great extent.

No attention was paid to the face of the nut until after the threads were finished. Then the halves were bolted together and faced off square, after which the nut was fastened to the bottom of the cross bar of the press.

The lubricant used was mutton tallow, but there certainly was more than that in the head of the man who made the screw.

The Elements of Production Grinding

By ELLSWORTH SHELDON
New England Editor, *American Machinist*

The sixth article — Two main classes of grinding machines — Sub-divisions of each class — Machines for every grinding purpose — Various makes of machines

THE MACHINERY for production grinding may be divided into two main classes: Cylindrical and surface grinding machines. Each class may then be sub-divided, the first into external and internal and the second into reciprocating and rotary grinding machines. Of both the rotary and the reciprocating surface grinding machines there are again two classes, those that have a horizontal wheel spindle and carry a disk wheel that grinds upon its periphery, and machines having a vertical spindle to carry a cup or cylinder wheel.

The so-called universal grinding machine grinds cylindrical work and, by means of an attachment, it may grind internal as well as external surfaces. There is still another machine, perhaps even more entitled to the term "universal," that is capable of grinding flat as well as round work.

Besides the above there are various types of machines that do not properly belong under any of the foregoing designations. Of these, the most widely used is the "floor grinder" or "wheel stand," that in some one of its many forms is used for all kinds of free-hand grinding, ranging from the snagging of castings in the foundry to the sharpening of tools in the toolroom. Cutter grinding machines, as their name implies, are used for sharpening the teeth of the many forms of milling cutters. Spline grinders shape the splined shafts commonly used on automobile transmissions. Form grinders use a formed wheel with which to turn out work of special shape, very much as a formed milling cutter would do, and are made both as cylindrical and surface grinding machines. Face grinding machines differ little in principle from regular surface grinding machines, but carry a cup wheel that grinds with the face instead of the periphery. Disk grinding machines are "floor stands" with disks of cast iron on opposite ends of the wheel spindle, to which are affixed circular sheets of abrasive cloth.

The plain cylindrical grinding machine, examples of which are shown in Figs. 31 and 32, may be considered to be in a measure supplementary to the lathe, though the range of its operations is very much more restricted. When a rough piece of material, as a forging, is to be reduced to a finished condition in the lathe, it is the finishing operations that require more than half of the time and nearly all of the operator's skill. The plain grinding machine is designed to take over these latter operations and put the finishing touches on the work in much less time and to a far greater degree of accuracy than could be expected of the lathe.

In producing straight, parallel pieces without shoulders from semi-finished stock, when there is but little material to be removed, the lathe may be dispensed with entirely and all of the work done in the grinding machine. Especially upon long slender pieces of work where roundness and parallelism are of extreme importance, and very difficult of attainment with the single cutting point of the lathe tool, the grinding machine possesses incalculable advantages.

> ALTHOUGH production grinding could never have reached its present proportions and extensive application without artificial abrasives, the principles embodied in the grinding machines themselves are not new. In fact we had all of them when all grinding wheels were "emery" wheels. The changes in the last twenty-five years have all been in the direction of strength, rigidity, power, and singleness of purpose. Though the machinery has been diversified and improved, the main difference between the old art and the new, lies in our understanding of its possibilities.

The universal grinding machine, shown in Fig. 33, has a much wider range of application than the plain machine. Though it may be classed as a production machine and is capable of turning out work within its capacity quite as rapidly as the plain machine, its real field of usefulness is demonstrated upon smaller and lighter work or in operations for which the heavier machine is not fitted. This class of work includes small tools and tool-steel parts that are hardened and therefore must necessarily be finished by grinding.

The universal grinding machine grinds cylindrical surfaces, parallel or tapered, internal or external and is also capable of face grinding or beveling at any angle. In short, the universal machine approaches more nearly to the versatility of the lathe but, by reason of its being a multi-purpose machine, it cannot be expected to compete in speed of any single operation with a machine that is designed for that operation alone.

The internal grinding machine, one of the many types of which is shown in Fig. 34, is designed for the sole purpose of grinding holes. Like the plain and universal machines it is provided with means for holding and rotating the work, for feeding the wheel transversely to the axis of the work (corresponding to the cross-slide of a lathe) and for reciprocating either the wheel or the work head.

The traversing movement in a direction parallel (or

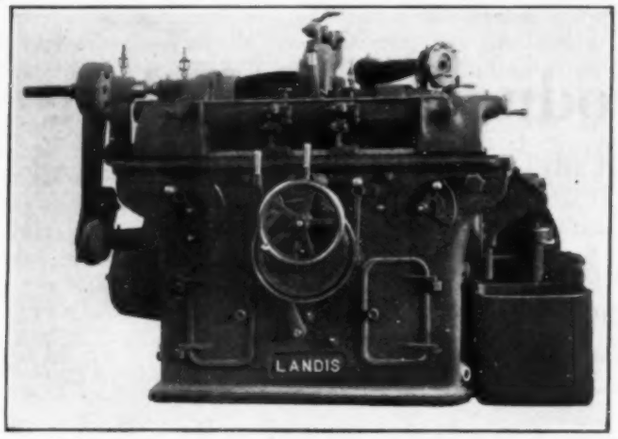


FIG. 31—LANDIS PLAIN GRINDING MACHINE

in the case of tapered work, at an angle) to the axis of the work, common to the plain, universal and internal machines, has an important bearing upon the quantity and quality of production. In all of the above machines the rate of traverse may be varied from a very slow movement to a rate approaching 50 ft. per min. in the latest machines. In general, it may be said that the rate of traverse should be determined by the width of

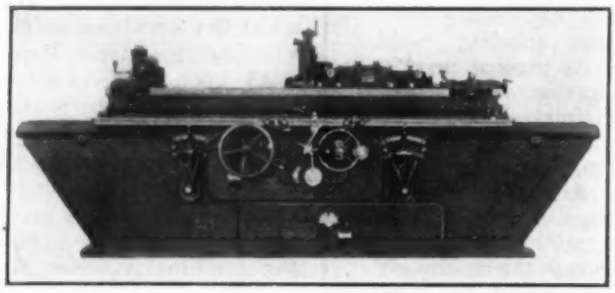


FIG. 32—NORTON PLAIN GRINDING MACHINE

the grinding wheel and that it should be so adjusted in relation to the rotative speed of the work that the latter will advance during the time of one revolution, a distance that is slightly less than the width of the wheel.

It will be seen, therefore, that the rate of traverse is dependent upon two factors; width of wheel and rotative speed of work and that any change in either will necessitate a corresponding readjustment in the

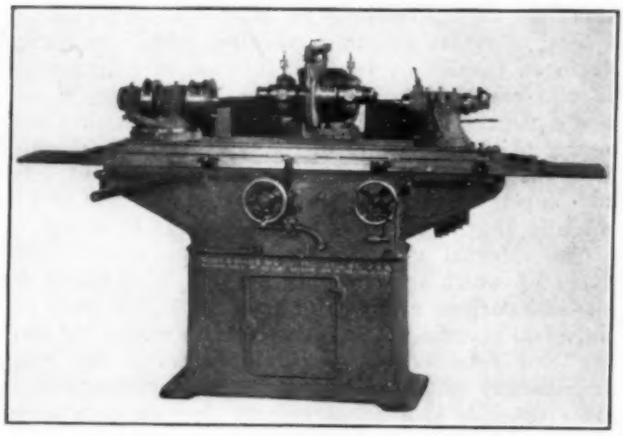


FIG. 33—BROWN & SHARPE UNIVERSAL GRINDING MACHINE

other. In the majority of machines this movement is driven by gearing and the adjustment is through a series of arbitrary steps or increments governed by the gear ratios. There are, however, upon the market a number of machines in which the traverse is operated by a hydraulic cylinder and piston, and any speed between the minimum and maximum is instantly available. This latter condition is also obtained in some types of machines by means of friction-disk drives.

As has previously been stated, the travesing movement is applied by some makers to the table and by

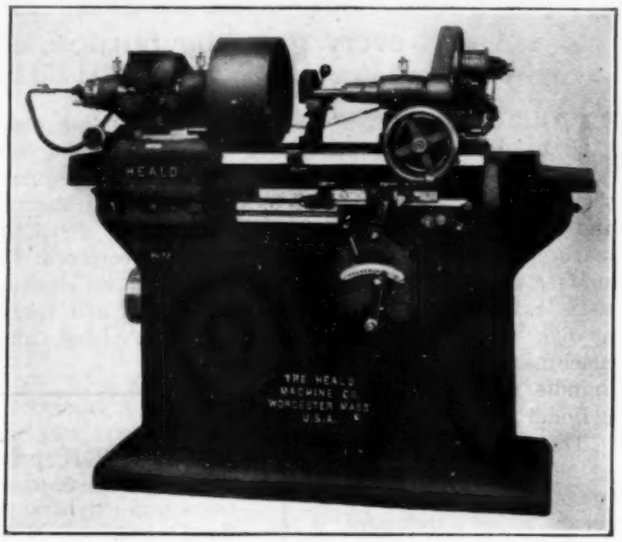


FIG. 34—HEALD INTERNAL GRINDING MACHINE

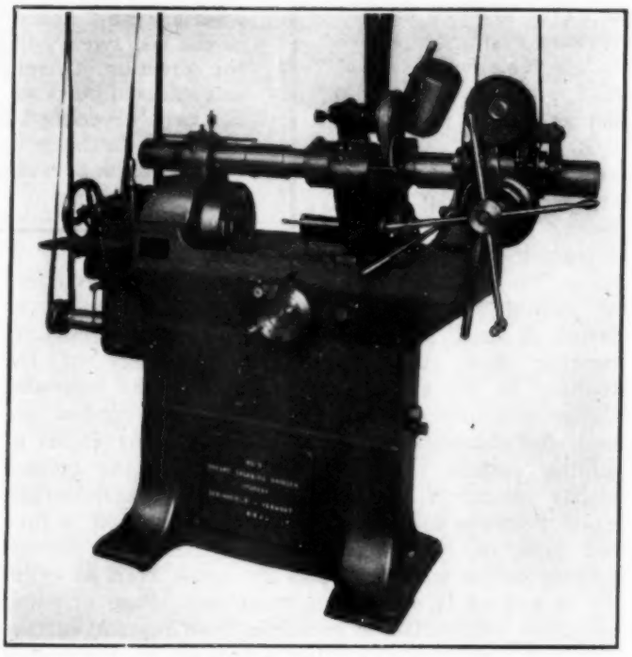


FIG. 35—BRYANT CHUCKING GRINDER

others to the wheel head. The machine illustrated in Fig. 32 has a reciprocating table, while in that shown in Fig. 31 it is the wheel head that moves. The necessary movement is entirely relative and so far as the work is concerned, it makes no difference to which member it is applied.

The latter statement applies to the universal and internal as well as to the plain machines and also, as

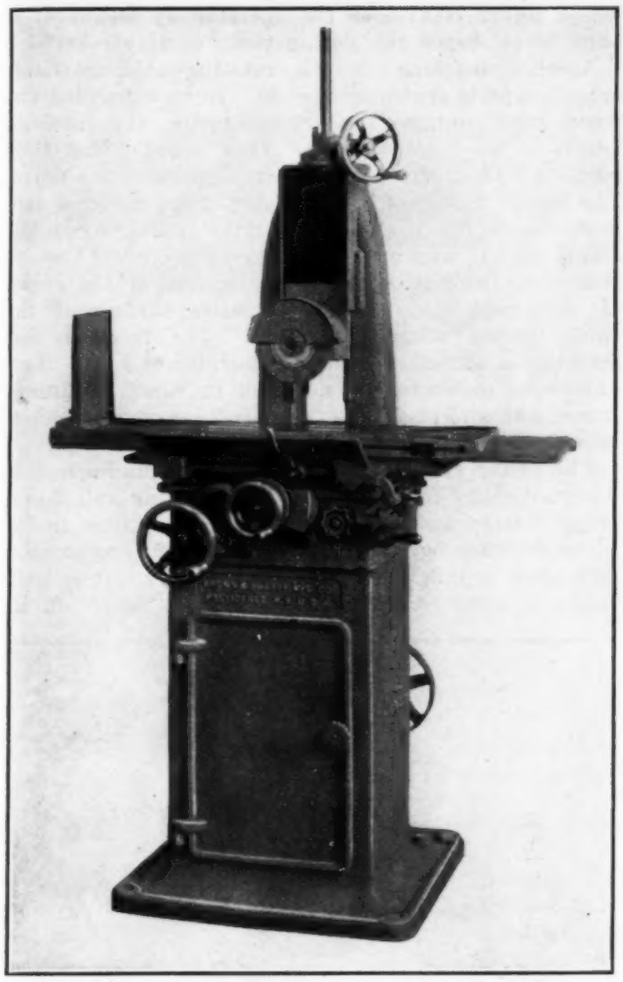


FIG. 36—BROWN & SHARPE SURFACE GRINDING MACHINE

will be explained later, to the surface grinding machines. An example of the traversing wheel-head internal machine is shown in Fig. 35, which machine is technically known as the "bar" type for the reason that the sliding surface is a round bar moving within adjustable bushings. The feed movement is applied by swinging the wheel head upon the bar and thus the cross-sliding head of the other machines is eliminated.

A standard type of surface grinding machine with reciprocating table and horizontal wheel-spindle is shown in Fig. 36. In this type of machine the reciprocating movement is usually imparted to the table by means of gearing but, unlike the corresponding movement of the cylindrical machine, there is no provision for changing the speed. There is a logical reason for this and it is that the reciprocating movement of the surface grinding machine is analogous, not to the traverse, but to the rotative speed of the work. The actual traversing movement of the wheel is accomplished by the feed and this is adjustable within a wide range.

A reciprocating surface grinding machine with a vertical spindle and cup or cylinder wheel is shown in Fig. 37. This machine is not provided with means of traversing the wheel across the work, for the reason that the wheel grinds upon its face and its diameter is such as to cover the entire width of work of which the machine is capable. The feed in this case is endwise of the wheel spindle, directly downward upon the work and takes place in very small increments at either or both ends of the table stroke.

In Fig. 38 is shown a rotary surface grinding machine with a horizontal wheel spindle. The spindle is carried in a ram similar to that of a shaper and has a reciprocating movement somewhat greater than one-half the diameter of the work-holding faceplate or chuck. Machines of this type are especially adapted to the facing of circular work, and by reason of the possible angular adjustment of the vertical work-holding spindle, are suited to the grinding of cutters, saws, and similar tools, the thickness of which must be slightly less at the center than at the periphery. They are not confined exclusively to such work, however, but are available for surfacing large numbers of small pieces, as many as the chuck will hold being operated upon simultaneously.

The movement of the ram in this type of machine is strictly a traversing one, corresponding to the traverse of the cylindrical machine, and may be adjusted to secure the proper relative speed according to the width of the wheel. In the machine shown in Fig. 38, the ram is gear driven but similar machines with hydraulically operated rams are upon the market.

The cylinder grinding machine, Fig. 39, is a strictly single-purpose internal cylindrical grinding machine, developed for the sole purpose of grinding the bores of automotive-engine cylinders, though, of course, it may be applied to the grinding of any cylinder bore within

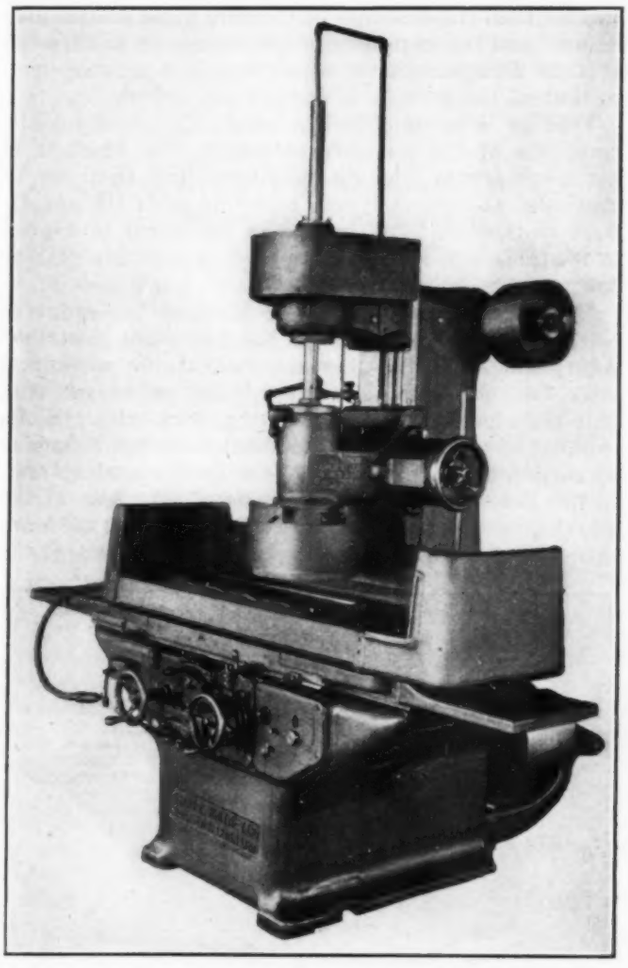


FIG. 37—PRATT & WHITNEY VERTICAL-SPINDLE SURFACE GRINDING MACHINE

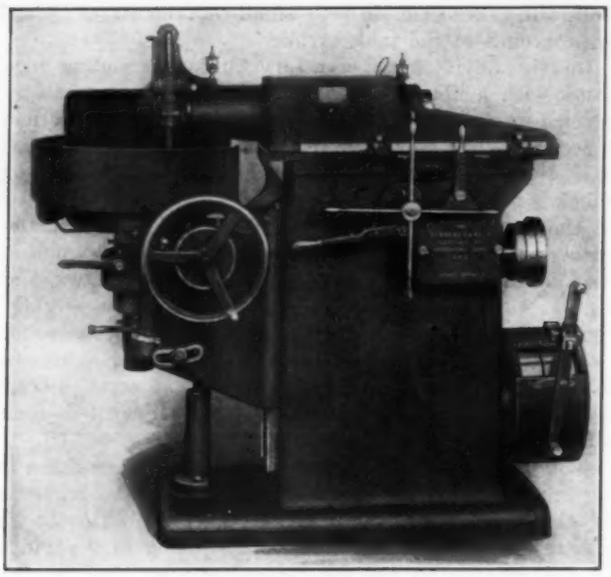


FIG. 38—PERSONS-ARTER ROTARY, SURFACE GRINDING MACHINE

its range. It has all the movements of the regular internal grinding machine and in addition thereto the wheel spindle is mounted in double-eccentric revolving bearings that impart to the wheel a gyratory movement, the amplitude of which is at all times under control of the operator. Any diameter of grinding wheel smaller than the diameter of the bore to be ground may be used and the amplitude of the movement so adjusted that the periphery of the wheel travels in a circle equal to that of the bore.

Feeding is accomplished by gradually increasing the amplitude of the gyratory movement, for which it is not necessary to stop the machine. The feed can be controlled as accurately and certainly as if the spindle were stationary. The traversing movement is applied to the table, and machines are made with either gear or hydraulic mechanisms.

The "single-stroke" grinding machine is applicable to the same class of work as the previously described rotary surface grinding machines but has a vertical wheel spindle with a cup or cylinder wheel covering half the diameter of the revolving work-table. While the feed of the previously described machines is applied by raising the entire head that carries the work spindle, in this case it is effected by a vertical movement of the wheel head. The machine is designed to finish the work upon the chuck by a single downward movement of the wheel, under control of the operator by means of a hand lever, hence the designation "single-stroke."

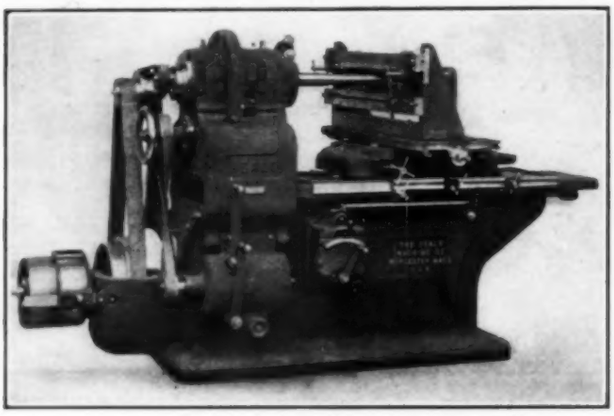


FIG. 39—HEALD CYLINDER GRINDING MACHINE

Another machine of the rotating-table, vertical-spindle type is shown in Fig. 40. In this machine the wheel head contains the driving motor, the rotor of which is one piece with the wheel spindle, and thus all belts and gearing are dispensed with in the drive. The rotary movement of the table is driven by a separate motor, which also operates the feeds. As in the single-stroke machine, the cylindrical wheel covers somewhat more than half the diameter of the chuck or work-table and grinds the entire surface of the work thereon without traverse. The feed in this machine is automatic and is accomplished by a single downward movement of the head by finely graduated increments and may be set to throw out at a predetermined point.

The cutter grinding machine, as its name implies, is designed solely for the purpose of grinding and sharpening cutters and is not a production machine in the sense we have heretofore used that term, except as it is applied to this particular class of work. It is built in many forms and is necessarily "universal" in its

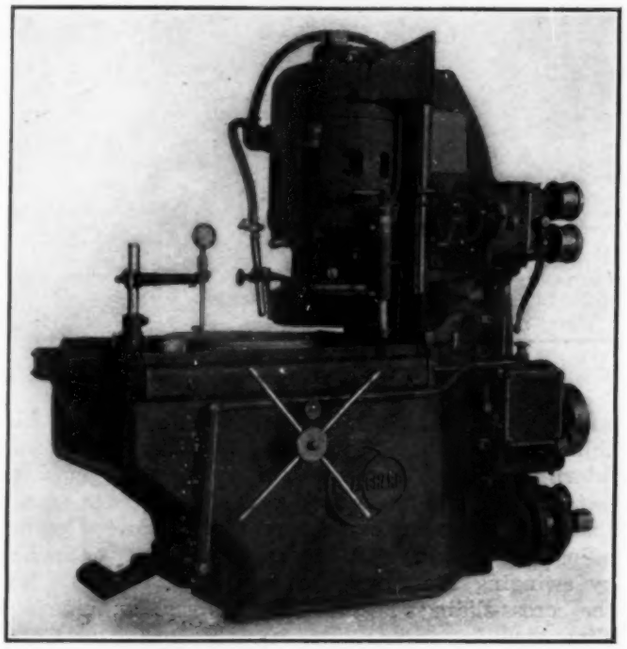


FIG. 40—THE BLANCHARD GRINDING MACHINE

movements, in that the grinding wheel may be brought into action in any conceivable position. It is, however, almost entirely a hand-operated machine and usually has no power-operated movements other than the rotative one of the wheel. A representative machine is shown in Fig. 41.

As has previously been stated, the universal, the reciprocating, surface and the cutter grinding machines were all very much in evidence long before the days of artificial abrasives but it is safe to say that the productive capacity and application of each has been vastly increased by the use of modern grinding wheels. On the other hand, though any of the other machines thus far described *might* have been made and used with "emery wheels," none of them were and their development may be regarded as a result of the possibilities disclosed by the advent of silicon-carbide and aluminous-oxide abrasives. In the succeeding par-

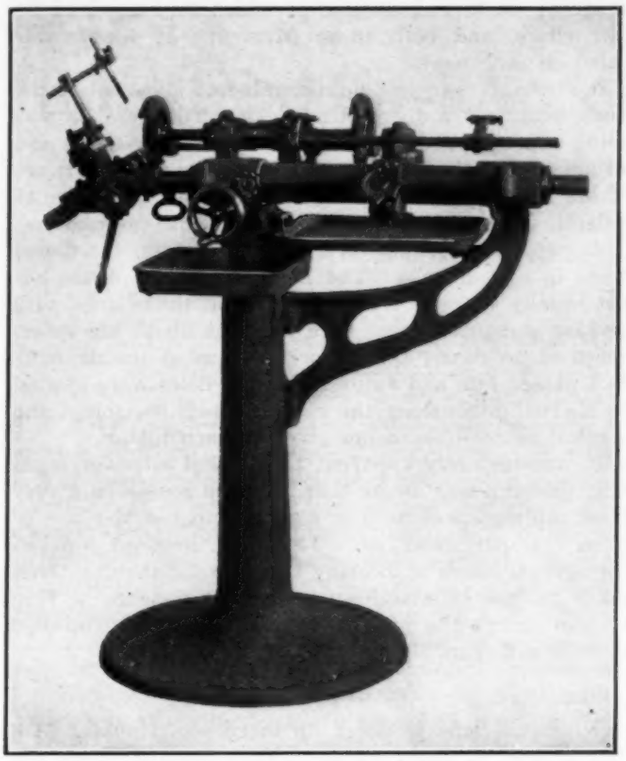


FIG. 41—BROWN & SHARPE CUTTER GRINDING MACHINE

agraphs a machine that could not have existed without the latter is briefly described.

The form grinding machine, Fig. 42, is designed for the purpose of finishing pieces of work having one or more shoulders; parallel, tapered, or of irregular form. It uses what is sometimes called a "set" wheel, that is, the wheel has no traverse but is fed straight in toward the axis of the work and finishes it to size and shape in one movement.

None but grinding wheels of artificial abrasive and of known and dependable quality of bond could be expected to withstand such treatment but with this machine, a wheel may be depended upon to reproduce its form on the work many times and the redressing to shape when necessary may be done in a very few seconds.

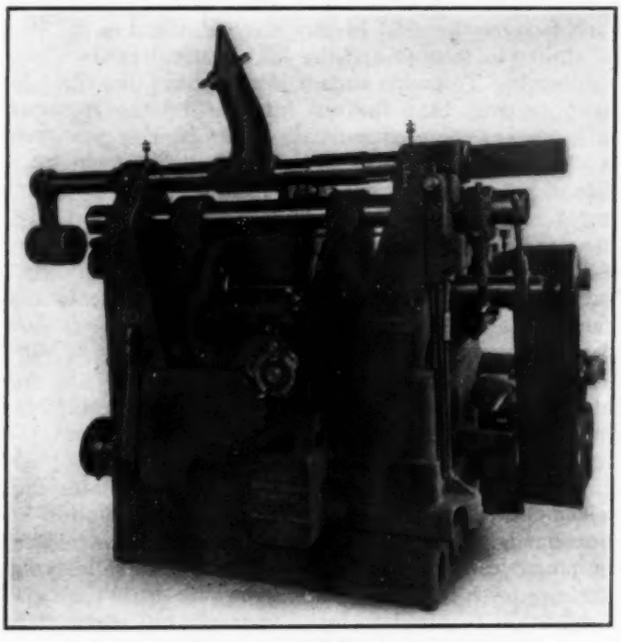


FIG. 42—BRYANT FORM GRINDING MACHINE

The form grinding machine is strictly a production machine and would be valueless except for producing duplicate pieces in large quantities. In the first place a "master" must be provided, having a carefully calculated contour the exact reproduction of that of the work to be ground, though not necessarily round. The machine is of the bar type with the work centers, instead of the wheel head, suspended from the bar. A second bar above the one upon which the work carrier is swung, carries a diamond that may be swung down and traversed before the wheel and in contact with it, being guided in its movements by the master.

The limitations of this machine are that it can not grind work longer than the width of the wheel; it can not be expected to stand up if called upon to remove more than a few thousandths of material and it can not grind square shoulders. In grinding shouldered work, the pieces must be prepared with ample wheel clearances so that the corners of the wheel need not touch the work.

The spline grinding machine involves the same principle as that for form grinding but is more of the nature of a surface than a cylindrical machine. It, too, is a development depending upon modern grinding wheels and designed for the purpose of grinding hardened, splined shafts used principally in automobile transmissions. The work is held upon centers but is rotated only intermittently by means of an indexing mechanism and never while in contact with the wheel, which grinds lengthwise of the work between the splines.

New Optical Strain Gage for the Bureau of Standards

A new and exceedingly sensitive optical strain gage for measuring the stretching of steel or other material under load has recently been perfected by the Bureau of Standards of the Department of Commerce. The device will measure a change of length as small as 1/250,000 in. The part of the instrument which goes on the material is only 2 in. long and is very light, so that it can be used for testing thin sheets of metal.

The gage itself has two knife edges which are set into the material under test. One is fixed in position, while the other can turn through a small angle to allow for the change in length of the material between the two edges. To the movable knife edge is attached a mirror, which is one of a set of mirrors which reflect back to the eyepiece the image of an illuminated mark contained therein. This mark is projected on the scale in the eyepiece, and before the load is applied the gage is adjusted to make this mark coincide with the zero on the scale. Thereafter the scale reads directly the extension of the material to which the gage is fastened.

The eyepiece which is used for reading the gage consists of an instrument something like a telescope in appearance and containing lenses, a scale, and a lamp for illuminating the scale. The optical system is of such a nature that the instrument will read correctly to within a tenth of one per cent if it is pointed within two and a half degrees of the perpendicular to the gage. It gives an unmistakable indication of whether or not it is pointed correctly.

Let Your Tools Save Your Brain

By D. L. Munster

THE result obtained by a mechanic who undertakes a job of machine or tool work is the sum of two factors: the personal—which comprises his individual brain and skill—and the tool factor, made up of the brains and skill of others as represented by the equipment provided for his use. The higher the sum of the two factors the better the quality of the work, and if one of the two be of relatively low value the other must be proportionately high to maintain a high average.

That a majority of mechanics recognize this to a considerable degree is evidenced by their cumulative investment in tools intended to enhance their skill of hand or precision of eye; yet the same men will operate machine tools day after day, making use of none but the basic elements of such tools and ignoring all the special labor and brain saving devices provided by the builder thereof for the purpose of increasing the productive capacity of the operator, while making his burden lighter and the quality of his work better.

Go into any shop or toolroom and any mechanic you may accost will know every tool he has in his kit. He can tell you without hesitation whether or not it contains a certain tool, or a tool that will serve any definite purpose, but not one man in ten can tell you in complete detail of the equipment provided by his employers for his use. The majority can tell you that the shop contains so many lathes, planers, milling machines, etc., but it is only the exceptional man that is familiar with all the uses and adaptations of the various tools and can explain how they may be employed to save useless expenditure of gray matter and time. Of special attachments, such as micrometer stops, measuring screws, indicating dials and the like, you will find that the average mechanic knows little, and is often unaware of their existence.

Standard Tools Superior to Homemade

A mechanic should know that the product of any maker of standard machine tools represents in its design and appointments immeasurably more thought and experience on the class of work for which each is intended than he could ever bring to bear upon his individual tasks, even though the quality of his brain and skill should compare favorably with those of the men upon the builder's engineering staff. Having convinced himself of this, he should be able to realize the benefit to himself of knowing the equipment with which he has to work as well and in as intimate detail as he knows his own tool kit, and be prepared to avail himself to the full of every device that has been put into his hands.

It must about break the heart of a machine tool builder to go into a shop and see how some of the pet features of his machines are unused and uncared for. But a few days ago the writer was in a toolroom where a fairly accurate class of work is done and for which a very good equipment is provided. Here are a few of the things he noticed:

On one of the Hendey lathes the cross-slide stop-rods were lost; probably thrown in the scrap box in some clean-up campaign without the scavenger even knowing their use or appreciating their value. On the same lathe a part of the micrometer stop of the carriage had been broken and never repaired, yet the Hendey lathe is strong on thread cutting, of which this stop had its fair share, and both these parts are of inestimable value on such work.

A mechanic was drilling a number of holes, all of the same depth, in a jig casting. The drill-press he was using was equipped with a graduated spindle-sleeve and adjustable depth stop, but they were beyond the range of his mental vision and he was drilling these holes to a depth gage, cutting and trying for depth on each one.

A man was working on a jig for drilling the flange holes in a gear case. The holes were in a circle but not equally spaced. He was laying off these holes with divider and prick-punch, and he went about his references so peculiarly that I took a slant at the drawing as I passed him and noticed that the holes were located by chordal dimensions, the distance from horizontal and vertical center-lines being given in each instance.

It was instantly apparent to me that whoever made that drawing was aware that the shop possessed a very good milling machine and had anticipated the use of it on this particular job. This man, however, worked for several hours at locating and center-punching those holes to his satisfaction; then prick-punched a ring around each in the most orthodox manner and proceeded to drill and ream them.

Trouble Develops

When he came to check up there was trouble. Adjacent sets of holes, symmetrically located, were not equidistant, and the foreman was brought into conference. More time was wasted while the foreman considered the case. The job was finally mounted on an angle plate in the milling machine and the holes rebored for oversize bushings; locating them for the purpose by using the horizontal and vertical measuring screws with their micrometer dials and working to the measurements on the drawing—exactly as the engineer had intended the job should be done in the first place. Everybody was all smiles when the job came out with no more than 0.001 in. as the greatest variation and seemed to think it a wonderful performance.

Whether this was good work or not, it is a fact, beyond argument that the degree of accuracy attainable by using the screws of a good milling machine is much beyond the skill of any mechanic, unless he has the ability to "button up" the job and the time to waste in doing it. To tackle such a job as above described in any other way than the one intended by the engineer simply means the setting out to do an inferior job when all the requisites for a better one are right at hand.

Know your equipment and its uses—that is the point. Employ it to save your brains and add to your skill. One method is to use your eyes and your common-sense; look over each machine, note its special and unusual features, dig around until you find its attachments and then try to reason out their uses and upon what sort of jobs you can use them to advantage.

Write to the makers of the machines you use for catalogs and books of instructions, and familiarize yourself with the special features and attachments of each. All makers of standard machines now publish information for the operators of their machines and welcome the opportunity to put such information in your hands. No investment in small tools or mental equipment can add more to your skill or enhance your earning power to greater extent than the little time and observation required to make yourself 100 per cent in knowledge of the possibilities of the machines you use.

Industrial Cost Accounting for Executives

By PAUL M. ATKINS

The twenty-second article—The machine rate method of allocating burden—Methods of handling the various factors—Determining the normal number of operating hours

IN THE preceding article it was seen that there were some rather important limitations on the use of a percentage on direct labor charges or hours as a method of distributing the earned burden to the product. It will be remembered that one of these important limitations was due to the difference in the cost of operating the several machines for the effort should always be made to apportion the burden in the same ratio as the service rendered. In order to permit the accurate distribution of the earned burden when there is a variety of machines within a single department, particularly when there is a constant changing of the kind of work which passes through them, the machine rate method of burden distribution with its correlative process method has been developed. These methods not only provide for burden allocation with a comparatively high degree of accuracy under such complex conditions, but they also make possible a valuable comparison of the relative cost of production by different processes and on different kinds of equipment which is very valuable as a guide to the best manufacturing methods.

The Fundamental Idea of the Machine Rate

The fundamental idea of the machine rate method of burden distribution is to consider all indirect costs as the costs of operating the various machines or production centers. The term "production center" is used to include not only machines but also work benches, erection places on the assembly floor, tanks, ovens and furnaces, where work on the goods is performed.

It may readily be seen that there are a number of factors which are essential to the operation of a production center. In the first place there is the production center itself, with its attendant costs—fixed charges, maintenance and sometimes cost of tools and fixtures. Then there is always a building factor to be considered for the production center must necessarily occupy some space. The costs of this factor are evidently the fixed charges on the building, its maintenance, and the cost of lighting, heating, and sometimes of ventilating it. If the production center is a machine there is the power factor to consider and its cost is either that of the purchased current or the cost of operation of the power department. Then there is the departmental factor whose cost is principally that of supervision, but which often includes the expense of moving material to and from the center, of inspecting it when the operation is completed, of giving instruction to the worker who is operating the center, of the liability insurance on the men who perform these tasks and of supplies consumed at the center for the benefit of the department as a whole. Finally, there are the remaining factors which do not touch the production center directly and which do not exist within the department but without which, nevertheless, it would be quite impossible for the center to operate—such factors as the purchase and storing of materials, the setting of manufacturing standards, the planning, scheduling, and dispatching of the orders through the factory and the design, manufacture, and storing of tools, all of which involve costs which have already been discussed under the head of departmental expenses.

The Machine Rate Sheet

When we have once grasped the idea that all of these can be treated as costs of operating the several production centers, the next step to consider is the means of so aggregating them that they may be embodied in the form of a rate, and made assignable to the product. The way in which this is done is by means of a machine rate sheet which is illustrated in Fig. 51. On this sheet are assembled all the costs of the various factors which enter into the operation of the production centers. It is essentially a working sheet for only the results which are obtained thereon enter into the composition of the cost accounts. It will be noted that many of the figures which are employed are estimates, but it should be remembered that they are based so far as possible on past experience with an intelligent evaluation of the future, so far as that may be done. They very often represent a truer measure of actual conditions than current figures which are sometimes affected by insignificant causes which result in wide fluctuations from the standards set.

As the sheet is commonly laid out one line is reserved for each production center or group of production centers which are alike from the point of view of operating cost, even though they may differ in other respects. In other words, the age of a particular machine which may have peculiar significance in some instances does not need to have any effect here. The rate of depreciation will be the same whether it is old or new though the amount of the reserve for depreciation set up for it would vary according to its age. On the other hand, special attachments may be sufficient to cause a difference in operating cost, and hence in the rate, and so serve to mark off two production centers from each other which in other respects may be exactly alike and of the same age.

It will sometimes be found when the rates have been calculated that two of them for entirely different production centers may come out exactly the same. This is

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simply a coincidence and does not at all mean that the next time the rate is figured the two production centers can be grouped together. The rate for a planer and milling machine may be the same in amount, but the various elements which serve to make up the totals are often quite dissimilar in amount. The cost of floor space for one may be greater than for the other, a figure which quite possibly is offset by the cost of power, for example, or the amount of depreciation. The effort should be made to arrange the production centers on the machine rate sheet in such a way as to make every step in the development of the rate clear and yet at the same time reduce to a minimum the labor of preparing the sheet.

It will usually be found convenient to use the plant register in dealing with the various production centers

MACHINE

Production Center	P.C. No.	Value	Fixed Charges			Maintenance		Tool Costs		Auxiliary			
			Dep.	Ins.	Tax.	Maint.	Maint. Dept.	Tools	Tool Dept.	No.	Value	Dep.	Ins.

RATE SHEET

Equipment		Building Factor		Power Factor		Departmental Factor			Purch.-Stores Factor	Plan.-Stand. Factor	Admin. Factor	Total	Hours	Rate per Hour
Tax.	Maint.	Sq. Ft.	Amount	K.W.	Amount	Supplies	Ind. Labor	Misc.						

FIG. 51—THE MACHINE RATE SHEET FOR ASSEMBLING THE COSTS OF THE VARIOUS FACTORS

because a large part of the information which is needed may be obtained directly therefrom or be calculated from the data there recorded. As a means of identifying each production center its number should be listed, and if a group of centers are handled together the numbers of all of them should be entered on the sheet. The numbers can, of course, be obtained from the plant register. So also can the amount of the fixed charges appertaining to the center and the amount of depreciation, insurance and taxes. This total for the period of a year should be entered against the production in the column headed "fixed charges." The next figure involves a calculation. The cost of the important repairs are commonly listed in the plant register and with this information it is usually not difficult to forecast what they will amount to for the coming year. It must not be forgotten, however, that this is not all of the cost of maintenance. To it must be added a share of the daily and weekly upkeep. The expense accounts of the previous period are the source of information on which the estimate of the periodic upkeep is based. When the maintenance costs of the center for an entire department have been forecasted the total for all the centers may be checked against the departmental machinery maintenance account in order to catch any serious mistakes.

The cost of tools is another item which is often very important, sometimes being the largest single element in the machine rate. The plant register sometimes shows the tools which are used with the center, particularly in the case of special tools. The list serves as a basis for estimating the cost of the tools used on the machine during the year. The total cost for the entire department should be checked against the tool maintenance account in order to note any conspicuous discrepancies. Accompanying this question of the cost of tool maintenance is that of the allocation of the expense of the tool manufacturing department. This is the expense of operating the department and not the cost of the labor and material used directly on tool orders which is, of course, charged directly to the orders themselves. The best way, usually, is to apportion this expense to the direct manufacturing departments in proportion to the tools made and repaired for each. In turn, this charge may be conveniently allocated to each production center according to the amount of tool expense chargeable to each in the preparation of the machine rate. We have substantially the same kind of problem in the case of the expense of the maintenance department which is distributed on the basis of the amount of maintenance work done for the several departments and which then may be assigned to the various production centers in a like manner. Columns are reserved for each of these charges against the production centers.

Auxiliary Equipment

It often happens that there is what may be called "auxiliary equipment" attached to a production center. Individual motors or cranes are examples of what is meant by this kind of thing. It is usually optional whether or not such auxiliary equipment should be used. It is a matter of choice, for example, whether group or individual drive for a machine shall be employed. In this respect auxiliary equipment differs from tools and attachments which form an integral part of the machine itself. It also differs in that it is customarily relatively permanent, and essentially a machine itself, this condition being recognized in the form of an individual card in the plant register for each unit of such equipment.

In case auxiliary equipment exists it is necessary to have columns in which its cost may be recorded against the production centers. The first of these columns is for a record of the motor equipment for purposes of identification, as in the case of the production center itself. In the second should be entered the fixed charges, and in the third, the maintenance costs, all in substantially the same way as was done for the center itself. In this case it is usually necessary to add the total of the maintenance costs of the auxiliary equipment to that of the production centers in order to be able to check

with the departmental machinery maintenance expense account for the costs of both are commonly recorded in the same expense account.

The building factor and its expenses require some calculations before the figure for the several production centers can be found. It is usually convenient to make use of a supplemental sheet for this purpose. The first step is to ascertain the number of square feet occupied by each production center. This means not only the actual physical space on which the center stands, but also such aditional space as may be needed for the operator, the operation of the center under all conditions, and the storage of the normal quantity of incoming and outgoing material. The total floor space of the department to be employed in making calculations in this connection is simply the sum of the areas of the production centers just described. This eliminates all such calculations as for aisle space.

The second step is to ascertain the costs of the use and occupancy of the department. The fixed charges and the maintenance are the principal items here, though sometimes the cost of heating, lighting and ventilation is sufficiently large to make it necessary to consider it also. In addition to these charges which are purely departmental in their character there must be added the cost of the general building upkeep from which the department in question, together with all others, benefit. Roofs, foundations, passage-ways, elevators and stairways are examples of this class of building subdivision. When such charges have been ascertained they may be estimated against the several direct manufacturing departments on the basis of floor space with substantial accuracy. The costs of locker and toilet rooms, however, should be kept separate, and subdivided on the basis of the number of employees in each department since the use of these parts of the building have no relation to the physical size of the departments but to the number of employees working therein. The departmental total should then be calculated and divided by the total floor space to give a rate per square foot for the occupied area. Fig. 52 shows a convenient way for organizing the necessary data.

The data are then ready to be entered on the machine rate sheet. The area occupied by the production center should be entered in a separate column against the center in question. The rate taken from the building factor sheet should then be placed at the head of the adjacent "amount" column and the extension of the area by the rate gives the amount of the building factor charge to be allocated against the production center.

The Power Factor

The power factor charge should be handled in substantially the same way except that it is much simpler as a large part of the work has already been done. The total power cost is represented by the budgeted expenses of the power department. It is sometimes necessary to deduct a certain part of this amount to represent the cost of heat and light, but the remainder in all cases is the estimated cost of normal power production. The normal total power consumption should be ascertained by summing up the power consumption of the various production centers. It should be remembered that it often happens that a machine does not utilize at all or for only a small part of the time its rated power consuming capacity. The aid of the engineer should be sought in obtaining this information. Having obtained the total power consumption and its cost, the cost per unit—horsepower or kilowatt—can be calculated. With this information in hand the cost of the power factor for each production center may easily be ascertained and entered on the machine rate sheet.

The departmental factor usually does not present any serious difficulties. When the various elements which

BUILDING FACTOR SHEET

Dept.	Fix. Chgs.	Maint.	Heat-Light	Gen. Bldg. Chgs.	Locker	Total	Sq. Ft.	Rate

FIG. 52—THE BUILDING FACTOR SHEET

make up its cost are totaled the result is simply divided equally among all the production centers. The same procedure is usually followed for the purchase-stores, planning-standards, and administration factors. Under special conditions other methods may be employed which yield greater accuracy without an excessive increase in the labor involved.

The next step is to sum up all the costs of the various production centers which have been allocated against them. All these costs should be worked out on the basis of a year in most cases, though sometimes a six months' period proves to be more satisfactory, so that now the cost of operating the several centers for a year is at hand. To reduce this cost to an hourly rate, one more bit of information is needed—the number of hours which the production centers can be expected to work under normal conditions.

The Normal Number of Operating Hours

This may seen like a very simple calculation, once the number of hours per day which the factory is expected to work has been determined. It is not always quite as simple as it seems at first glance, however. Everyone who has had any experience in a factory knows that it is quite impossible to keep the machines or work places operating 100 per cent of the working hours. In some cases, when the production centers are simply work-benches, for example, it is possible to approximate the number of hours very closely, provided men, material, and orders are at hand. A certain amount of time must be allowed for those unexpected breakdowns which are sure to occur from time to time in spite of all that may be done to anticipate them, for inability to arrange schedules so as always to prevent gaps, for failure of workers to come as usual, and for other unforeseen contingencies.

It is usually wise to take as the normal working time, the time which the planning department uses in scheduling production, an average probably about 80 to 85 per cent of the theoretically possible working time. One other condition needs to be thought of also when discussing the question of hours. It sometimes happens that some production center is not expected to work all of the time which might reasonably be expected from the capacity of the machine. This state of affairs occurs when a center has such a rapid rate of production that working only a small part of the time is sufficient to keep up with the other centers which operate with it on the same orders. It is necessary under such circumstances to employ the number of hours which it is expected the center will normally

operate, even though its capacity is very much larger.

Having entered the normal number of working hours against the production centers, it is a very easy task to obtain the hourly rate by dividing the total normal yearly cost by the normal yearly hours. The machine rates so obtained should be entered on cards, sheets or some of the modern labor saving devices in such a way as to be readily available for use in applying the burden to the product.

The actual application of the machine rate is quite simple. The time tickets for the workers should be so arranged as to show the production center at which the work is performed. If this is done the earned burden can be allocated to the product by extending the time shown on the ticket by the rate which can be easily found when the production center number is known. The burden is then carried against the order by the same voucher which carries the direct labor charge.

The Process Rate

It sometimes happens that an extension of the machine rate is very helpful. It will be remembered that it was pointed out in an early article that occasionally labor which was expended directly on the product could not be charged to it conveniently. The enameling of metal parts, the operation of automatic lathes, or cotton or woolen looms of certain kinds are examples of this kind of thing. When such conditions exist it is often convenient to include the labor of operating the production center as a part of the burden rate which is then commonly called a "process rate." It is quite as easy to forecast the cost of labor for the operation of the production center as it is to estimate many of the other costs which go to make up the rate, and so it becomes one of the many items going into the makeup of the rate. In other respects there is no difference between the two forms of the rate.

The records to be made in the controlling accounts are not complex though the preparation of some of the entries involves more detail than is required for the direct labor hour or charge methods. It is usually desirable to employ a burden journal—a book very similar in its ruling to the stores journal—in which should be recorded each day the amount of the earned burden ascertained by summing up the burden charges on the time tickets. The total of this journal at the end of the month gives the credit to the manufacturing burden account and the distribution column totals give the debits to the worked material and merchandise in process accounts and any others to which earned burden may be charged. If the process rate is used, care must be exercised to see that the direct labor which forms a part of the process rate is charged to the manufacturing burden account and not directly to the "in process" accounts as failure to do this would make it impossible to check up the distribution of the direct labor. At the end of each period the distribution of the earned burden to the several orders should be checked with the controlling account entries and any serious discrepancies located and corrected.

Ordinarily a rate once set may be used for a year. If business conditions are rapidly fluctuating, however, it may be necessary to change the rate every six months and when the method is first employed, perhaps even more often. Experience is a good teacher in this matter and each time a rate is reset it should be estimated with ever increasing accuracy.

The description given of the development of these rates makes them appear cumbersome and difficult to use. Their actual day by day employment causes little difficulty and only slightly more clerical labor. At the same time they provide a means for dealing with relative accuracy with conditions which otherwise would almost certainly preclude any satisfactory attempt at burden application. These methods are not perfect, but they do permit a comparatively high ideal of control of the allocation of the earned burden.

Wanted—A Museum of Machine Tools

By L. L. Thwing

WHAT we need is a sort of Pepys' Diary of a mechanic in the early part of the last century. How interesting it would be if we could have the detailed experience of just one day. What time our diarist got up; what he had for breakfast; what time he started work; what sort of a shop it was; from what did they get their power; how many and what kinds of machines did they have; what kinds of tools did they use; how long did it take to do a certain piece of work, and a thousand and one details that would paint a picture of the early American mechanic—what he had to do, and how he did it.

Fortunately man's works last longer than he does himself so that while we have very few mechanics of 1850 with us today, there are in the aggregate a good many tools in this country that were built even earlier than that. They are naturally not to be found in the productive line of a modern shop, but you will find them stored away and forgotten, or used in some non-productive way. The writer was in Brandon, Vermont, ten years ago and saw there a practically new chain feed lathe. It was explained that the original owner of the lathe had died shortly after purchasing it, and his widow had stored it in a barn for over fifty years. Another chain lathe is in use today for wood turning in the carpenter shop of a well known company.

An Old-Time Milling Machine

The Union Vise Co. of Boston was the predecessor of the Brainerd Milling Machine Co. and one of the first to build a plain column and knee type miller. A machine of this make dates back to the seventies or earlier. One of these machines is held for occasional use today, but its owner has offered to give it to the Smithsonian Institute when it is finally discarded. Within the last year the writer has seen a Jones and Lamson planer, a New York Machine Co. drilling machine with a square thread on the spindle sleeve, dating probably to civil war times, and a small boring mill that is even older. Today these machines are practically junk—fifty years from now they will be valuable museum pieces if we can get them preserved.

The following is a quotation from a letter received from Guy Hubbard, whose interesting articles are now appearing in the *American Machinist:*

I shall be very much interested in the progress of the movement for the preservation of old-time machine tools, and believe that action should be taken on this matter at once for the reason that such ancient tools are rapidly becoming extinct. For instance, at the present time I know the whereabouts of one of the first turret lathes

ever built; this having been built by the Robbins & Lawrence Co. at Windsor, Vermont, in 1854. I also know the whereabouts of one of their original Howe milling machines, built in 1849 (now the well known Lincoln milling machine), and one of their original universal milling machines of 1850. Each of these machines has made history in the engineering fields, as they are unquestionably the first of the thousands of such machines since manufactured.

The cylinder for the first locomotive brought to this country is in the basement of the Smithsonian Institute as there is no room for it on the exhibition floors.

It is deplorable that we have no special museum for early machine tools, one that will house examples of the early builders' work. The Smithsonian Institute is full of devices built with machine tools, but contains not a single example of the machines themselves.

This is no original thought as this situation has been recognized by the Allied Engineering Societies and a committee appointed to discuss ways and means for securing such a museum. This is naturally a slow process, and in the meantime, due to economic pressure, old and obsolete tools are being scrapped every day.

There are a large number of empty, or nearly empty, buildings, products of the world war, which could be used to store these relics until such time as the museum is an established fact. I have no doubt that the owners of the buildings would offer storage space, and I am sure that the owners of old machine tools would donate these tools for such a museum if properly approached. In the meantime the writer would be glad to learn the location of any exceptionally old (light) machine tools, or other machines that deserve a place in the museum. A list of these will be kept until such time as provision is made for storage. Any communication will be forwarded to me by the editor.

The Care of Tracings—Discussion

By W. Roland Needham
Goodmayes, Essex, England

THE notes which follow are largely the outcome of an intimate knowledge of drawing office requirements and routine. They are not offered by way of criticism of the main propositions laid down by Dwight C. Howard in the original article under the same heading on page 479, Vol. 58, of the *American Machinist*. If in any sense these suggestions clash with those, then the reader must adjudge from the peculiar circumstances which obtain in his particular case, which of the two methods will the better suit him.

Where there is no marked partiality, nor rules and regulations to forbid it, it is not a bad plan to trace on the dull side of the tracing cloth. The ink catches in better, and less preparatory dusting of the surface is required. Not only so, but the natural curvature of the cloth automatically assists in tightening the sheet. This action is clear when we recall that the tracing cloth as rolled has its prepared surface inwards. Thus when one applies a sheet to the board dull surface uppermost, the tendency of the cloth to curl downward at the ends actually expresses itself by a flattening of the sheet onto the board. The tracer can then quite easily pin down the sheet so that it is well stretched and taut.

Where full size tracings are required one can, if it be deemed advisable, pin the cloth onto the edges running the length of the board. The drawing would be held in place at each corner by good quality sticky-back strips. The tracing cloth would, of course, overlap the top and bottom edges of the board, so as to permit of the necessary tacking down. Sticky-back strips can be added about mid-position on each edge along the width of the tracing sheet. Such an expedient enables one to keep the main surface of the drawing board reasonably free from pin holes.

It is usually quite good to tear off the selvage of the cloth. It tears very readily and cleanly. One can perform this minor operation with speed and yet without undue risk of damaging the cloth. The time factor is not unimportant.

Unless it be for exceptional work, it is excellent policy to maintain a tracing staff as distinct from a drawing staff. Women often make tracers *par excellence*. Where a draftsman does his own tracing work his tracings are seldom so neat as those done by a whole-time tracer. It may be objected that the draftsman can all the better reproduce his own work and also effect certain economies in the original. The writer does not in any way minimize this aspect of the case. However, a tracer can quickly familiarize herself with the idiosyncrasies of the men whose work she has in hand.

The method suggested tends to promote a measure of uniformity which otherwise might be lacking. Since the drawings have to be interpreted by men in the workshop, the technique of the tracing counts for more than many men appreciate. The most important consideration, however, is that of the relative importance of the work different people are called upon to undertake. If a draftsman be paid £6, 10 shillings per week and a tracer £4 per week, it is surely quite obvious that, unless things are slack, it is far more profitable to keep the higher paid employee at the designing and drafting end of the job.

So far as the cleaning of tracings is concerned, this work can be undertaken quite well by one or the other of the tracing staff. Such instructions as Mr. Howard gives could with advantage be issued as office orders to the tracing staff.

It is most desirable that the general character of all drawings for any one works should be as nearly uniform as possible. Thus methods of projection, arrangement of views for certain classes of work, method of dimensioning drawings, provision for requisitioning material, size of drawings and the like, should be standardized. This matter is of extreme value to the foremen and others who have to read the drawings in the shops, as it simplifies matters tremendously.

To this end, despite its flavor of red tape, it is a first-rate policy for the chief of the department to issue standard instructions. The instructions should deal clearly with these important matters, and above all they should be concise and as few in number as possible. The wordy and frequent variety as a cure is almost worse than the disease. But they must be firm instructions.

The printing room staff should be carefully instructed in the importance of the work undertaken, and be made to realize the great value of the tracings handled. Firm instructions here would often cut out much grievous and entirely unwarranted damage to highly important tracings.

These notes are not meant to be exhaustive. They are offered purely by way of suggestion.

Ideas from Practical Men

Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered, and those published are paid for

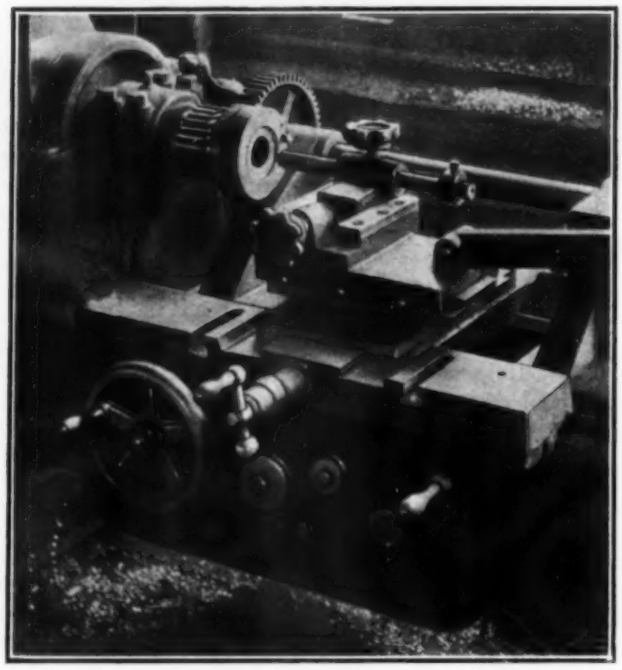
Oil Grooving Attachment for a Lathe

BY HAROLD BROWN

An inexpensive and handy arrangement for oil grooving is shown in the illustration, the gear guards being removed to show the construction.

It was found necessary to cut "figure eight" oil grooves in 10,000 bushings and, as the time to rig up for the work was very limited, we had to use any parts we had on hand.

The device shown consists of a pair of spur gears to



OIL GROOVING ATTACHMENT FOR A LATHE

give a 2 to 1 reduction between the spindle and the shaft at the back of the fixture; a pair of mitre gears to give the proper motion to the slotted disk; a slide to fit the compound rest of the lathe, and a top slide to carry the tool bar and feed the cutting tool into the work.

The cutter bar is flattened on top and held in proper position by means of the hand screw shown over the bar. The collar on the bar is used for locating the position of the cut in the work. The chuck has a split clamp-bushing which holds the work by means of a hollow-head setscrew in the periphery of the chuck. The pin to be seen in the end of the chuck was used for a special job, which was flanged, and fitted a drilled hole in the flange for locating.

The slide is adjustably connected to the slotted disk by a connecting rod, so that the length of stroke can be changed to suit the work. The carriage is locked to the ways after job is set up.

In operation, a bushing is placed in the chuck and fastened securely by tightening the clamping screw, the bar is set in position with the collar against end of bar holder and the hand screw tightened. The machine is then started, the slide receiving a reciprocating motion from the crank disk, while the tool is fed into the work by means of the hand knob facing the operator. The cutter bar can be withdrawn far enough to allow the removal and insertion of the work. The machining time was 20 sec. for each bushing.

The time necessary to get this device ready for production was very limited so, before it was fully designed, the mitre gears were secured, the ones used being discarded from an old automobile differential. The large spur gear was an easier matter, being a change gear from an old lathe. The actual time and cost of building the device was as follows:

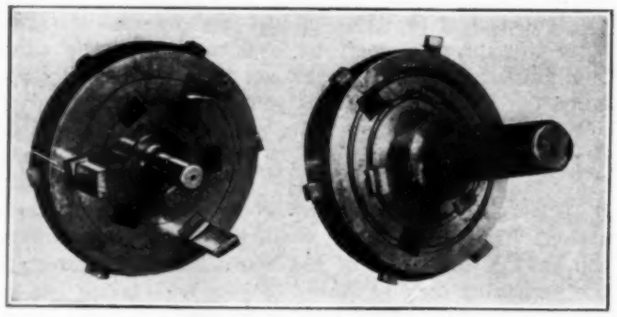
Design, 15 hr. Pattern, 40 hr. Machining and assembling, 53 hr. Material $15.

Trepanning Tool for Flue Sheets—Discussion

BY E. A. THANTON

The trepanning tool described by R. E. D. Delrue, on page 921, Vol. 58, of the *American Machinist*, is good, but I believe we have one that beats it, in that it may be used for more than one size of hole; cutters are easily set, reground or replaced; pilot is easily replaced with another of different size; and the whole tool is not difficult for any fair machinist to make.

As shown, there are three trepanning cutters, but more or less can easily be put in. If the pilot and shank are centered, the blades may be ground to suit



A SIMPLE TREPANNING TOOL

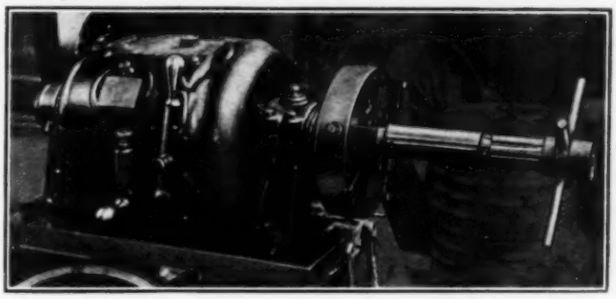
the circle to be cut, in any good-sized cylindrical grinding machine, or turned in a lathe before hardening and then stoned for clearance. For heavy work the body should be made of machinery steel, although sometimes it could be made of cast iron. The shank may be tapered and pressed into the body, or the body may be shrunk on. The pilot should be tapered so as to press into a taper hole in the part of the shank that projects through the body. If a drift hole is made in the shank, the pilot can easily be removed.

Floating Holders for Reamers—Discussion

BY A. R. GAGE

In writing about floating reamer holders, J. T. Towlson, on page 149, Vol. 59, of the *American Machinist*, says he had to finally resort to hand reaming in order to get accurate results. This is all right, but ordinary hand reaming is a pretty slow job and I am showing the way we do "hand reaming" by machinery.

The reaming we have to do is the finishing of the



POWER DRIVEN HAND REAMER

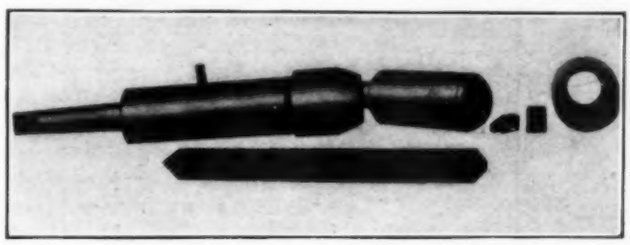
hole in brass bushings. We had on hand an old geared head from a lathe that was wrecked by accident. This head we mounted as shown and placed an adjustable hand reamer in the chuck. The bushings are held in a special holder and kept from turning by means of a setscrew which is very lightly screwed down onto the work. In effect, the device makes a power-driven hand reamer with all of the advantages of a floating reamer holder and with none of its disadvantages. Various speeds and reverse are obtained by shifting the hand lever on the lathe head.

Of course, it is entirely possible that the pieces handled by Mr. Towlson could not be so easily moved by hand as are these bushings, but the idea may be used for numerous small articles.

A Chuck for Flat Drills

BY FRANK AVEY

It is often convenient or necessary to make drills out of flat-bar stock, but it isn't always easy to hold them properly. We do a lot of odd jobs and find



A CHUCK FOR FLAT DRILLS

frequent use for various sizes of drills, yet it would hardly pay us to keep a large stock of regular drills on hand, since it is seldom that we get any two jobs calling for drills of exactly the same size. For this reason we resort to the making of special drills from flat-bar tool steel. These drills we can forge or grind to any fractional size we need with very little trouble.

However, it isn't always easy to chuck a flat drill satisfactorily, so we have made several chucks like the two shown in the illustration. A chuck of this kind has only five parts in all: the body, which includes the shank; the clamping cap; two jaws; and a stop pin which keeps the drill from slipping up too far into the body slot.

A completely assembled chuck is shown at the left and a disassembled one at the right.

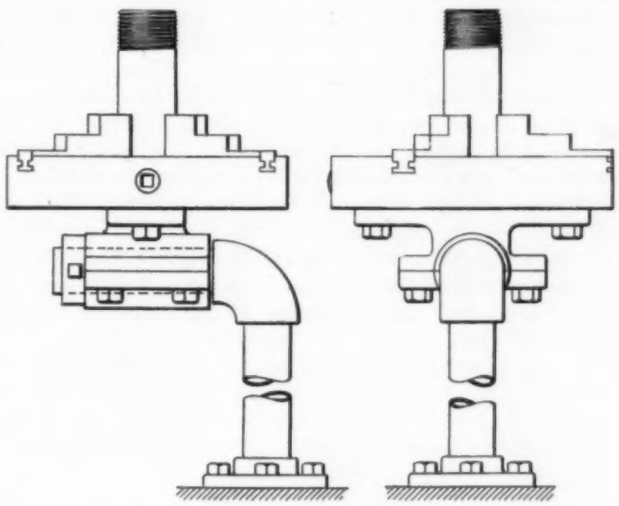
We make the body and cap of machine steel but caseharden the latter. The two jaws are also casehadened but the other parts are left soft. For a better class of work it might pay to caseharden all the parts and to grind the shanks, but for our purpose they are all right as described.

A Universal Floor Vise

BY JOE V. ROMIG

The universal floor vise here shown and described is a very handy piece of equipment for the assembling or other department where there are any number of round pieces of work to be held temporarily; as in die-threading bolts, correcting damaged threads, and many similar jobs for which the regular bench vise is neither suitable nor convenient.

The principal item in the bill of materials required



FLOOR VISE MADE FROM CHUCK

is a 3-jawed universal lathe-chuck. Preferably one that has outlived its days of usefulness for its original purpose and has been superseded. The remaining parts are: about 3 ft. of 3-in. pipe, a flange, an ell, a nipple and a small pillow-block casting.

The nipple should be put in the lathe and its body turned to a diameter that will just clean up and leave the nipple round and smooth. The flange is lagged to the floor, the pipe screwed in the flange, the ell screwed on the upper end of the pipe and the nipple screwed into the ell. The pillow-block should be bored to clamp on the turned nipple, and its base fastened to the back of the chuck by means of the regular chuck-bolts.

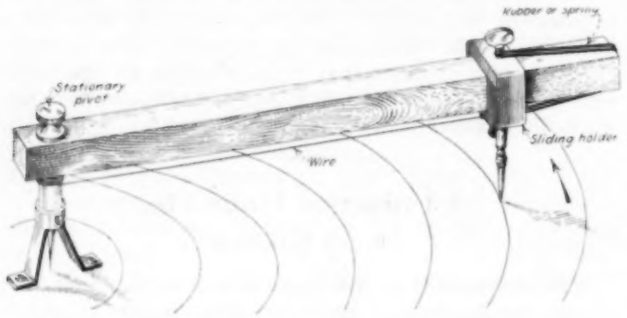
This rig provides a vise that can be used for many purposes and is especially adapted to holding round pieces. It has the further advantage that it may be located anywhere on the floor that may be convenient to the work.

Device for Drawing an Accurate Spiral

BY ERNEST JONES

An effective method of describing an accurate spiral has been developed by Dr. Rippey of McKinley Tech, Washington, D. C. The method was evolved because of the need for a mathematically accurate drawing for a new calculating instrument known as the Spirule.

Spirals are ordinarily drawn by using two or four



HOW SPIRALS CAN BE ACCURATELY DRAWN

centers and drawing part of the curve from each by means of a compass, the result approximating a spiral. In the Rippey method, an ordinary beam compass is employed. The ruling pen or pencil has sufficient lateral movement to care for the largest and smallest radii required on the spiral. A rubber band is fastened to the holder and also to the end of the beam. From the pen or pencil holder a fine wire is carried to the fixed stationary pivot of the compass, through a hole drilled therein and fastened in any convenient manner. The length of the wire from the pivot to the pen determines the radius.

The pen is set at the outer radius required, the wire is tightened by winding it on the pivot and movement of the compass about its pivot is begun. The wire is thus wound upon the pivot so as to continuously shorten the radius until the completion of the spiral. The distance between the turns is regulated by using a pivot, or a bushing on it, of the proper size. One turn of wire around a 1-in. drum would make an interval of 3.1416 in. between the turns on the paper, being the same between each turn made. The interval will always be 3.1416 times the diameter of the pivot.

Computing a Connecting Radius

BY HUBERT G. SMITH

The following formulas were worked out by the writer in the absence of data covering the problem given, and are submitted for the benefit of others who may be interested.

Referring to the figure, the problem is to find the radius R of an arc which will connect with an arc drawn from center P with the radius D. The distances A, B and D are given. It will be noted that where the required arc is flat the center O is at so great a distance that a drawing board layout is inconvenient and the easy computation of the required radius is then a distinct advantage.

In order to find the required radius R, the distance X is first computed and for this a distance C which equals B minus D is used.

$$C = B - D$$

The expression for X is then found to be

$$X = \frac{A^2 - C^2}{2C}$$

This relation is readily shown by combining the

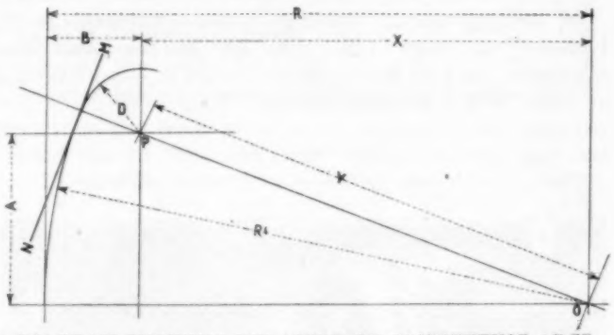


DIAGRAM SHOWING RELATION OF CONNECTING ARCS

various factors of the problem algebraically as follows:

$$\begin{aligned}
X + B &= R \\
X + D + C &= R \\
Y + D &= R \\
R - D &= X + C \\
R - D &= Y \\
X + C &= Y \\
X^2 + A^2 &= Y^2 \\
X^2 - Y^2 &= -A^2 \\
X - Y &= -C \\
X^2 - 2XY + Y^2 &= C^2 \\
2X^2 - 2XY &= C^2 - A^2 \\
X(X - Y) &= \frac{C^2 - A^2}{2} \\
X &= \frac{A^2 - C^2}{2C}
\end{aligned}$$

When the value of X is determined the value of R is very easily found by using the first of the series of equations above.

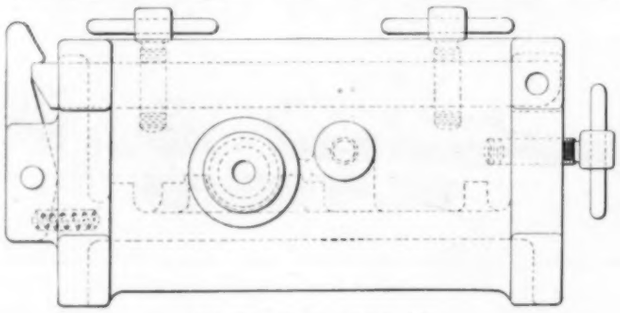
$$X + B = R$$

The line MN is a common tangent at the connection point of the two arcs.

Automatic Catch for Leaf-Jig

BY EDW. L. ROBENOLT

The accompanying sketch shows a simple and convenient form of catch to be used in connection with leaf- or hinged-cover jigs. When the binding screws that



CATCH FOR LEAF JIG

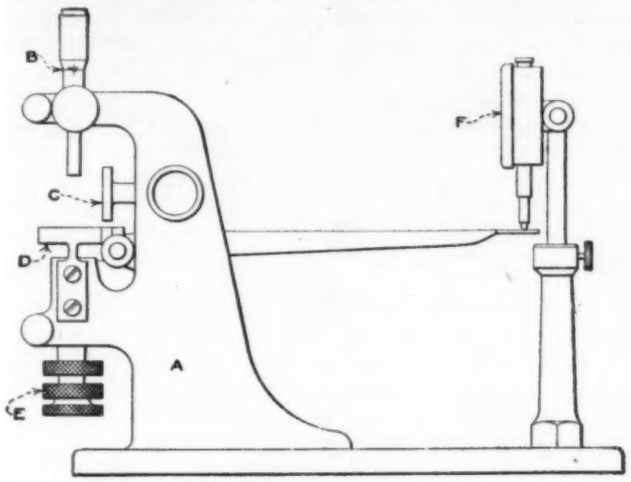
hold the work are released, the operator has only to press back the catch with his thumb against the action of the enclosed coil spring, and lift the cover. Lowering the cover to place on the next piece of work automatically locks it without further attention from the operator.

Measuring Piston Pins

By Herbert F. Crawford

The H. R. L. Motor Co., Seattle, Wash., is specializing in piston pins for replacement work and has built the measuring device shown herewith for inspecting the finished pins.

The frame or base *A*, carries a micrometer barrel at *B* and a backrest at *C*, the latter being adjustable so



DEVICE FOR MEASURING PISTON PINS

as to handle pins of different diameters. The movable or measuring plunger *D* is also adjustable by means of the knurled screw and check nut at *E*, and is connected by a multiplying lever to the dial indicator *F*. The dial indicator is also adjustable vertically so that the measuring device can be readily set to handle work within a wide range.

After this gage has been once set, work can be handled very rapidly, and the combination of the multiplying lever and the dial indicator makes it easily possible to read extremely small variations very rapidly.

Lubricating a Clutch Pulley

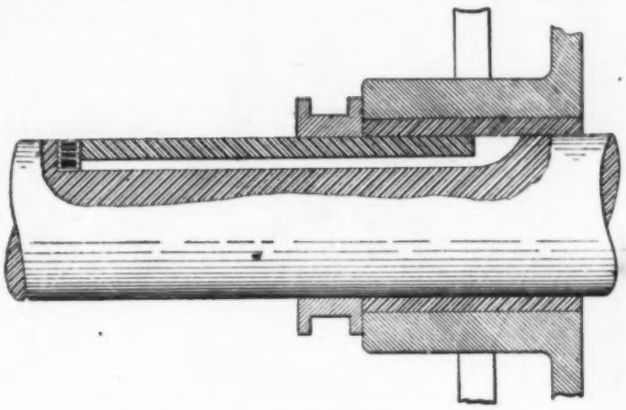
By James Ellis

In our plant there is a 4-ft. clutch pulley located about midway of the length of a 2⅛-in. shaft. The condition of the drive is such that the pulley runs continuously while the shaft is stopped and started periodically by means of the clutch, and remains idle for a considerable part of the time.

We experienced difficulty in keeping the bearings of the pulley properly lubricated, so much so that the bushings would wear out about every six months, while the shaft itself had to be replaced every year. What was needed was a way to get oil or grease to the pulley bearings through the shaft while the latter was idle, and the way we accomplished it was as appears in the accompanying sketch.

We first milled a keyway in the shaft ⅜ in. wide by 1/16 in. deep, from a point midway of the pulley bushing to a point well outside the clutch collar. Next, a keyway, or slot, 1/16 in. wide and deep was milled the whole length of the larger slot at the bottom. A piece of ⅜-in. key stock was then fitted in the larger keyway, peened in place and filed on the outside to conform to the circumference of the shaft.

The new piece was fitted flush with the outer end of the slot and left about ¼ in. short at the inner end, as the sketch indicates. A hole was then drilled and tapped through the outer end of the piece and we thus



OILING A BEARING THROUGH THE SHAFT

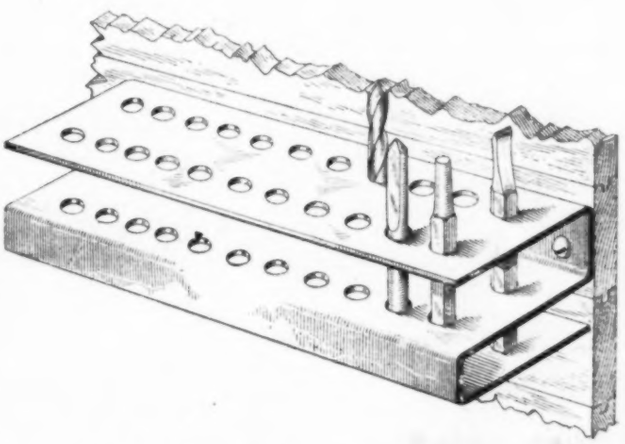
have a 1/16-in. square oil channel running through the shaft to the middle of the bearing. A grease cup screwed into the tapped hole completed the arrangement.

We can now force oil or grease right to the center of the pulley bearing at any time when the shaft is stopped.

Sheet Metal Rack for Small Tools

By G. A. Luers

A cheap and easily made rack for small tools, such as punches, chisels, wrenches, screwdrivers, etc., is shown in the accompanying sketch. Placed in some position above the bench where it is conveniently



SHEET METAL RACK FOR SMALL TOOLS

accessible, it provides a place to keep such tools between times of using and thus saves the workman from the annoyance of having them roll off and get lost.

The rack consists of a single piece of sheet metal bent in the form of a letter S, with holes of suitable size drilled or otherwise cut through the upper and middle planes. It may be attached with screws to any convenient beam or to the wall above the bench, within easy reach of the workman.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors

September 20, 1923

The Machine Tool Builder and the Second Hand Problem

PRIMITIVE instincts have an uncanny and sometimes unpleasant way of persisting in the interior construction of the human being no matter how thick his veneer of civilization. Given the right conditions and the most peaceful citizen will join in a man hunt—to the death, if necessary. Under much less provocation he will pursue the hoary pastime of bargain hunting. He may scoff and jeer at his good wife when she frequents sales at the department stores but he knows, deep down in his heart, that he is a hypocrite and that he is just as bad as she is when he thinks he sees a bargain.

It is this ineradicable human quality that is responsible for one of the two phases of the second hand problem as it confronts the machine tool builder. He may talk himself blue in the face about the risk run by the purchaser in buying machinery that is without any service guaranty whatever and that may be in almost any kind of disrepair under the surface. He may present veritable armies of figures to prove that the cost per piece of product will be less with the higher priced new machine. All his arguments fall on deaf ears when the bargain mania grips the customer. Nine times out of ten the bargain turns out to be a delusion but the ardor of the bargain hunter never seems to abate. It even seizes the machine tool builder himself at times and causes him to adopt policies in purchasing tools for his own shop that hardly square with what he urges on his customers.

But there is also the other phase of the second hand problem and it is certainly no less difficult to overcome than the one we have just mentioned. It concerns the making of excessive allowances for old machines which are traded in by customers.

The tremendous production of automobiles has given the manufacturers and dealers a second hand problem that has resulted in many a failure. You can probably remember at least one dealer in your own town who thought to make a fortune by a large bulk of new car sales stimulated by fat allowances on old cars and who went to the wall in consequence. His exact counterpart, unfortunately, exists in the machine tool business.

It is one of the strange contradictions of human nature that a man who will adhere to his printed price list with the tenacity displayed by chewing gum when you step on it, will make allowances on second hand tools offered in trade that speak ill for his ability as an appraiser of values.

Some people are ill-natured enough to look upon this practice as closely akin to price cutting. Perhaps it would be more charitable to call it a misguided form of altruism. Misguided, because the beneficiary never appreciates what is being done for him but rather scorns his benefactor, and also because it almost invariably leads the benefactor to financial ruin just as in the case of the automobile dealer mentioned above.

As to the first phase it is probably too much to expect that such a deep-seated human characteristic will yield to argument and education without the expending of much more effort than has been put forth in the past. When it comes to the other phase of the problem there is perhaps a little more hope. Those who insist on loading themselves up with worthless traded-in machinery eventually fail and in so doing leave one more horrible example of bad business practice for their successors to avoid.

Wanted— A Machine Tool Museum

WE ARE very glad to print on page 452 a communication from L. L. Thwing which points out the desirability if not the actual need for a Museum of Machine Tools. While this is not a new idea, and Mr. Thwing disclaims any credit for originality, it has been too long neglected and many old machines which would have made valuable exhibits, have found their way into the cupola.

There have been spasmodic attempts to start a museum of this kind, but they have been short lived and have never even made a real beginning. We believe, however, that this is a good time to inaugurate a movement of this kind that will be of real service to all concerned. All that is necessary is to have the builders of machine tools realize the desirability of such an institution. For with their active organization, behind such a movement its success is assured.

Such a museum will have more than a sentimental interest although even this is not to be altogether overlooked. It will have a real value in showing designers how various problems were solved in the early days and will, in many cases, show how some of our bright ideas were anticipated long years ago.

We do not believe there will be any difficulty in securing storage space for exhibits in some of the war buildings which are now practically empty. Nor will there be any trouble regarding the donation of old machines from many quarters. All that is needed is a definite program with a live organization behind it, to assure the success of the movement at this time.

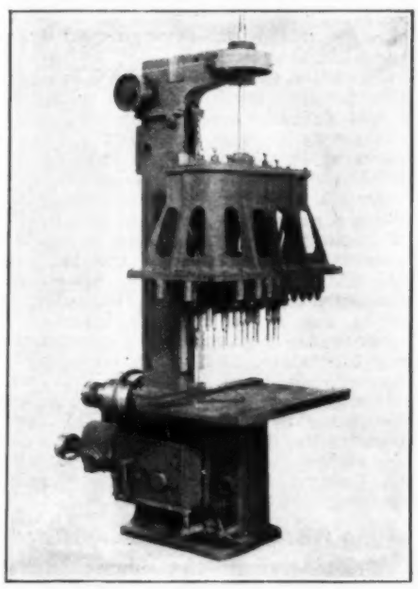
The *American Machinist* stands ready to assist in the movement for the establishment of a museum in which typical machines of earlier periods may find an honored resting place, for the benefit of the industry at present and in the future. We shall be glad to hear of any machines which are old enough, and typical enough, to deserve a place in such a museum. Such information will be turned over to the proper persons for action in securing desirable exhibits. The movement needs the cooperation of all who are interested in machine tool developments. And this we are sure, will be forthcoming. For, without the development of machine tools we should have none of our great industries but would, of necessity, be leading a primitive existence.

Shop Equipment News

Fox Multiple Spindle Drilling Machine

A multiple spindle drilling machine which is designed for automatic rapid drilling is a recent addition to the line of drilling machines manufactured by the Fox Machine Co., Jackson, Mich.

A feature of the machine is the aluminum drill head, the casting for which weighs 174 lb. To suit the requirements for which the machine was built the head is bored for 22 spindles, arranged in three clusters. Twenty of the spindles are ¾ in. in diam. with No. 1 taper, and two are



FOX MULTIPLE SPINDLE DRILLING MACHINE

⅝ in. in diam. with No. 0 taper. The spindle speed is 2,000 r.p.m.

As shown in the illustration, the aluminum head is secured to a cast iron saddle which slides up and down on the column. The maximum travel of the head is 7 in. and is automatically repeated as long as the operator keeps his foot on the treadle at the base of the machine.

The feed gearing for the head is so arranged that the head will make 5, 8 or 11 cycles per min., a 580-lb. counterweight being provided to reduce the force required for reciprocating the head. The variation in length of feed is accomplished by adjusting the radius of the driving crank, which is done by moving the crank pin in a slot in the crank disk. The feed changes are made by sliding cone gears and the feed clutch is of the saw tooth type. The feed worm gear is bronze and the worm wheel, which is on the same shaft as the adjustable crank, is of soft steel. All feed gearing runs in oil. The crank mechanism gives a quick return motion to the head.

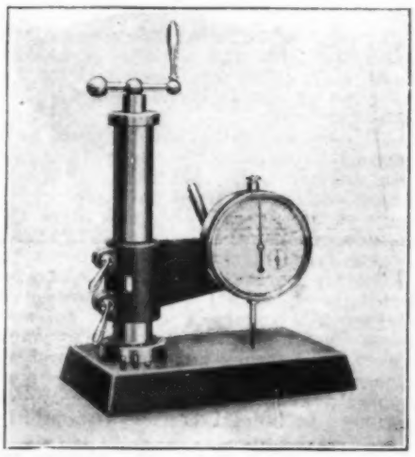
The head saddle carries a bronze adjusting nut, by means of which the position of the head may be adjusted vertically through a distance of 15½ in. The column guides for the head saddle are of steel.

The drive shaft is arranged to be driven from a countershaft at 400 r.p.m., and drives the feed gear box shaft through a belt on the small pulleys at the rear of the machine. The driving shaft of the head is also belt-driven from the main drive shaft, suitable idlers being provided for changing the direction of the belt.

This machine has a special table and a standard column 58 in. long. The net weight of the machine is 2,800 pounds.

Waltham Universal Gage

A gage mounting for its 4-in. dial indicator is now being marketed by the Waltham Dial Gage Co., 85 Myrtle Street, Waltham, Mass. This mounting is used for the measurement in quantity of parts which are to be held within certain limits. It is said to eliminate chances of error due to wear of inspection gages, to handle work quickly and to show what the errors are.



WALTHAM UNIVERSAL GAGE

The base is 10x6 in. and carries the upright column upon which slides an overhanging arm. To this arm an indicator is attached as shown in the accompanying illustration. The arm is moved vertically by means of the ball crank at the top of the column and clamped in position by the two levers at the side.

The upright column gives a gaging capacity of 6 in., and the distance from the column to the indicator spindle is 3¾ in. The weight of the gage is 22 lb. and it is 14¾ in. high.

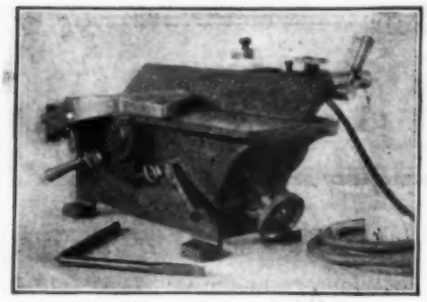
Whipple Portable Motor-Driven Bench Jointer

The Nazel Engineering & Machine Works, Nicetown, Philadelphia, Pa., has recently placed on the market a 4-in. portable motor-driven bench jointer which will be of interest to pattern and other wood-working shops.

The box-shaped base has inclined ways upon which the two tables may be adjusted and clamped in position. The surfaces of the tables are ground to insure proper alignment and are provided with inserted steel lips, machined to give a minimum opening of ⅛ in. at the cutting circle. The rear table has a rabbeting ledge, the front table being extended to suit.

The gage or fence is supported by an arm attached to the main frame and can be set at any angle up to 45 deg. An aluminum safety guard of unusual design is pivoted on the table.

The cylinder is of the three-knife, solid, safety type and is direct-connected to the motor shaft. It is machined from a crucible steel forging and constructed to leave only sufficient knife throat opening for free cutting of any kind of wood. The knives are of high-speed steel and all rotating parts are dynamically balanced.



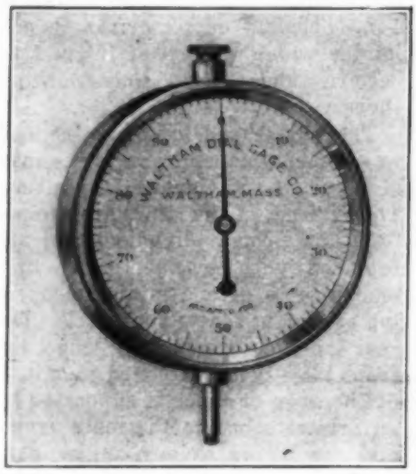
WHIPPLE BENCH JOINTER

The machine is regularly equipped with a 60-cycle a.c. motor of desired voltage or a d.c. motor for 115 or 230 volts, but a.c. motors for other cycles can be furnished. A heavy snap switch is mounted on the motor casing and a suitable cord and attachment plug is provided.

Waltham 4-Inch Dial Indicator

An indicator of unusually rugged construction and with comparatively heavy parts has recently been placed on the market by the Waltham Dial Gage Co., 85 Myrtle St., Waltham, Mass.

The dial, which is 4 in. in diam., is divided into 100 divisions, each division representing 0.001 in. On account of the large diameter it is said that the graduations are large enough to permit reading to one-half or one-quarter of a division. A dial reading from 0 to 50 each way will be furnished on order.



WALTHAM 4-INCH DIAL INDICATOR

The dial revolves in the case and can be set in any position with respect to the pointer by turning the knurled bezel. The travel of the spindle is ½ in. and is transmitted to the pointer by means of a so-called floating rack and suitable gearing.

The floating rack is a feature of the indicator as it is said to cushion the shocks on the gears, and to give accurate readings whether the spindle is gently lowered or snapped down on the work.

The spindle is regularly fitted with a button tip but any shape of tip or contact point can be furnished. The spindle runs in hardened steel bushings. A lug on the back of the instrument has a ⅜ in. hole for attaching to any machine. The indicator weighs 3¾ pounds.

Methods of Payment for Exports

Before and since the world war many articles have appeared in the press on the subject of export trade which have given special emphasis to the matter of the terms that should be granted, and it would appear that so far as machinery is concerned a great deal of confusion has arisen. In this way a situation has developed that makes a better understanding desirable.

In the first place it should be recognized that practically all machinery represents a capital investment, as contrasted with hardware, haberdashery, and other classes of commodities that pass directly into consumption. As good banking makes it necessary for lending institutions to maintain their accounts in liquid form if possible, it is perfectly obvious that a banker is justified in restricting his loans in so far as they apply to machinery. It will also be recognized that the ordinary machinery manufacturer will not have sufficient capital invested in his business to justify him in tying it up for long periods. Some reports received from foreign countries in connection with export business suggests that foreign buyers should be allowed liberal terms—a remark which if applied to consumption goods, might be interpreted to mean the allowing of 90 or 120 days before demanding payment of the accompanying drafts. If this expression is applied to goods representing capital investment, such as machinery, and to transactions negotiated directly with the ultimate consumer, one might infer from these reports that a year or more should be granted to the purchaser.

There is nothing about export business that makes it necessary to engage in unbusinesslike practices. Properly handled, export trade in machinery is one of the cleanest and most attractive kinds of business, and unless there is some particularly good reason to the contrary the trade should be kept upon this basis. For a manufacturer to allow his customers a year, more or less, in which to pay for factory machinery, appears to be a most unbusinesslike procedure, because one must infer that he is encouraging his customers to build factories without first providing adequate capital, and it is not a kindness to encourage an oversea buyer to engage in business without sufficient fixed capital, as this arrangement suggests that there would be almost no working capital, and the particular enterprise would be seriously handicapped from its inception. In ordinary cases it therefore appears that so far as factory and industrial machinery are concerned, the user should have funds with which to buy before being allowed to sign a contract. This fact in itself suggests that it will not ordinarily be necessary to grant unusual terms in connection with machinery sales when these transactions represent investments of fixed capital.

From a Trade Information Bulletin, Department of Commerce.

Other Cases

For the sake of simplicity, the above has been so worded as to suggest a transaction executed directly between the machinery manufacturer in this country and a factory owner abroad. But to this extent the above remarks are misleading, because such transactions are unusual. Almost invariably American industrial machinery is sold in foreign countries through machinery dealers residing in the various foreign cities. The question of terms may therefore be complicated somewhat out of regard for the wishes of the machinery dealer as distinguished from the ultimate consumer.

From the very nature of his business the foreign machinery dealer to be successful must keep his capital turning over very rapidly, and for the purposes of this discussion it may be desirable to assume that this dealer will turn his capital over some five or six times a year. He will therefore prefer to arrange his transactions in such a way that he is able to collect from his customers before paying his obligations to his principal. Obviously, it is to the manufacturer's interest to promote the convenience of his foreign representative, and, quite conceivably, terms should be extended that will allow the foreign dealer time to adjust his financial arrangements. This complicates the discussion, because there is an endless variety of terms extended to foreign buyers by these foreign dealers.

An Excellent Arrangement

Frequently the machinery dealer abroad will negotiate a contract arranging for payment, perhaps one-third with the order, one-third on delivery, and one-third after test. If, for purposes of argument, we assume that the customs duty, delivery charges, and dealer's profit at destination approximate one-third of his contract price, it becomes clear that the final payment he secures from his customer covers his expenses after the arrival of the consignment at point of destination, and the two earlier payments make it possible for him to pay the original charges shortly after arrival. This, in fact, is a very common arrangement and again shows the possibility of making prompt payment. There are a large number of transactions where this particular arrangement is not possible, but, on the other hand, in many cases it will be found that terms such as those just described are actually employed. It will, therefore, ordinarily meet the dealer's requirements if the consignment is accompanied by a draft payable soon after arrival of the shipment.

News Section

Decrease Shown in Employment

Preliminary figures of employment in the United States made public by the Bureau of Labor Statistics, a branch of the Department of Labor, indicate that there was a decrease in August, as compared with July of two-tenths of 1 per cent, but an increase of seven-tenths per cent in the total amount paid in wages, and of nine-tenths per cent in average weekly earnings.

The figures compiled are for fifty-one manufacturing industries, representing 6,598 representative establishments, with 2,279,659 employees. In one week in August these employees received $59,967,607. The same establishments in July reported 2,284,642 employees whose weekly wages aggregated $59,564,865.

Some Increases

Comparing August with July, increases in employment are shown in twenty-two of the fifty-one establishments, and increases in total wages in twenty-one industries. The greatest increases in wages were in the pottery, iron and steel, flour, women's clothing, boots and shoes industries. The greatest decreases in wages were in machine tools, steel shipbuilding, shirts and collars, and automobile tire industries.

Increased employment was shown for the flour, fertilizer, pottery, structural iron work, confectionery and ice cream and boots and shoes industries. The greatest decrease in employment was in machine tools, "due entirely to annual vacations." The automobile tire industry had the next heaviest decrease.

Complete Plans for Power Exhibit

Dec. 3 to 8, 1923 are the dates set for the National Exposition of Power and Mechanical Engineering and the place will be the Grand Central Palace, New York City. Contracts already signed give assurance that the coming event will exceed that of last year, which was the first exposition of the kind, both in size and diversity. In addition to exhibits of devices for the generation of all kinds of power, space has been set aside for equipment used in the transmission of power. This will add greatly to the interest of the exposition.

All Engineers Interested

The appeal of this exposition is to engineers not only in the power and mechanical fields but in all fields. Notable advances in the art and science of power generation will be packed in the Grand Central Palace and even the technical man, only casually interested in power, will find novelties to interest him for several hours.

The co-operation which the American Society of Mechanical Engineers is extending is an indication of the importance of the Exposition. The A.S.M.E. annual meeting parallels the first four days of it, and to permit the mechanical engineers to reap the benefits of both meeting and exposition, the power and mechanical sessions at the meeting are to be assigned to the morning. As the Exposition does not open until noon each day there is no conflict and members can have ample time to give careful study to the Exposition. The American Society of Refrigerating Engineers' meeting also parallels the first days of the Exposition and members of that organization, as well as mechanical engineers, will be admitted on display of their badge.

Illinois Central's Program

As its portion of the improvement program of the railroads of the United States the Illinois Central now has under construction or has authorized expenditures for work that will cost a total of approximately $145,000,000. Included in this huge expenditure is the construction of a Chicago terminal extension, new equipment that the railroad has purchased for 1923 and the new 166-mile line from Edwood, Ill., to Fulton, Ky.

The financing of some of these undertakings has already been provided, and in other cases the improvement will not be completed for some time, so that the $145,000,000 to be expended by the railroad will be spread over a number of years.

Of the new improvements, the largest is the Chicago Terminal. This work has been going on for some time, and when completed will give the Illinois Central greatly improved terminal facilities in the Chicago district. It will cost about $82,000,000, according to the present figures.

Pennsylvania Tries New Equipment

New locomotives to enable the Pennsylvania R.R. to get the same motive power on its branch lines as it gets with the big locomotives on the main line are now being tried out by the railroad. The first of these locomotives, of which forty are now on order at the Pennsylvania's shops in Altoona, Pa., has just been delivered.

When completed it is expected that they will be ready for use on either the branch or the main lines. They are designed to handle heavy passenger trains where the heavier locomotives would damage the light trackage. This was accomplished by dividing the driving weight over three pairs of wheels instead of two and by using larger cylinders and smaller wheels, it was said.

Steel Production Declines

The August rate of steel ingot production was about 42,400,000 tons a year, representing a 3 per cent decrease from the rate of the previous month. There has been a gradual decline in steel production since April, when the rate of output was considerably greater than it had been thought the steel industry could attain, with the difficulties expected to stand in the way.

The rate now is probably about 41,000,000 tons a year, which would represent a 16 per cent decrease from the record rate, but would still be a slightly higher rate than was reached at any time last year. Even with the decrease in production in the last four or five months, steel is being produced at between a 25 and 30 per cent higher rate than the average in the four postwar years, 1919 to 1922 inclusive.

Unfilled Orders Increase

The unfilled obligations of the United State Steel Corp. decreased by 496,100 tons during August, against decreases of 475,498 tons in July and 595,090 tons in June. In the three months, the Steel corporation's bookings ran fairly uniform, averaging a trifle more than half the capacity, while shipments decreased from about 92 per cent of capacity in June to about 87 in August. As the independents have been able to make earlier deliveries on new business than the Steel corporation, they have been in better position lately to secure orders, while on the other hand they stood more in need of orders. This spell has now lasted about five months, but the dullness is only relative, there being a volume of buying that would have been called large fifteen years ago.

More Locomotives Are Conditioned

The railroads of the United States have realized the program of the American Railway Association by reducing the number of locomotives in need of heavy repair on Sept. 1 to 14.7 per cent of the number of locomotives in line. The program as announced last April provided that the number on Oct. 1 should be reduced to 15 per cent.

This is the smallest number of locomotives in need of heavy repair since Aug. 1, 1920, when the Car Service Division began the compilation of these reports. The total of 9,392 locomotives in need of heavy repairs, on Sept. 1, was a decrease of 1,095 from the number on Aug. 15.

The railroads on Sept. 1 had 53,438 serviceable locomotives. They had, also, 2,714 locomotives in good repair but stored for future use, an increase of 47 since the middle of August. The heavy Fall freight that is anticipated will need engines in the best of conditions.

Personals

HENRY MARX, president of the G. A. Gray Co., Cincinnati, has recently returned from a vacation spent at Lake Placid, N. Y.

HARRY B. LINDSEY, sales engineer with the Norton Co., Worcester, Mass., will join the staff of the C. D. Tuska Co., Hartford, Conn., in the capacity of sales manager about Oct. 1.

HOWARD E. ADT, president of the Geometric Tool Co., New Haven, Conn., returned recently on the S.S. Lapland from a three months tour of Europe.

L. KATTENBURG, director of R. S. Stokvis & Sons, Holland, with a branch office in the Whitehall Building, New York City, arrived from Rotterdam recently and will spend about two weeks in this country.

S. G. EASTMAN, who has been the district manager for the Niles-Bement-Bond Co., New York, in the San Francisco, Calif., district, has been transferred to the Chicago district where he will serve in the same capacity. He succeeds GEORGE F. MILLER who has retired.

OLIVER A. LANCHANTIN will be the general manager of sales of the Eastern Steel Products Co., Spring City, Pa. Mr. Lanchantin was formerly manager of the Pittsburgh office of Oliver Bros., New York.

F. M. WYSS, formerly superintendent of the Dunham Co., Berea, Ohio, has been made foundry superintendent for the Michigan Gray Iron Castings Co., Detroit, Mich.

H. V. FREEMAN, for eight years with the Mack Iron & Wire Works, Sandusky, Ohio, and previous to that connected with the Federal Steel Sash Co., Waukesha, Wis., is president of the H. V. Freeman Co., Lima, Ohio. The company was recently organized to deal in products such as metal lath and steel sash.

J. D. PHILLIPS has been appointed office manager of the new Oakland, Calif., plant of the General Electric Co. Mr. Phillips, who was formerly traveling auditor, will have charge of accounting, statistics, payrolls and all clerical operations at these works.

CLARENCE F. TYRRELL, assistant treasurer of the Reeves Pulley Co., Columbus, Ind., has announced his intention to resign his position about Oct. 1 and seek other business connections in California.

WALTER A. DEEMS, for the past ten years master mechanic of the Baltimore & Ohio's New York terminals and the Staten Island Rapid Transit Co., has resigned as of Sept. 15, and has joined the machine tool department sales organization of Manning, Maxwell & Moore, Inc., with headquarters at 100 East 42d St.

FRED C. SHAEFER, Atlanta, Ga., has been appointed Southern representative for the Parks, Cramer Co., Fitchburg, Mass. His headquarters will be in Atlanta.

JAMES R. DOWNS has been promoted from manager of the Pittsburgh office to manager of the mining department of the Burke Electric Co., Erie, Pa. His headquarters will be maintained in Pittsburgh.

W. J. B. SMITH, for many years secretary of the Beaman & Smith Co., Providence, R. I., has severed his connection with that firm and has established a station at 63 Baker St., Providence, R. I., for the painting and refinishing of automobiles.

WILSON K. RAY of Pittsburgh, Pa., formerly of the staff of the Industrial Machinery Division of the Department of Commerce, has been appointed assistant trade commissioner, assigned to France with headquarters at the American embassy.

A. J. MCELHONE has been appointed advertising director of The Eaton Axle & Spring Co., Cleveland, Ohio.

DOUGLAS ANDREWS has been added to the sales staff of Wills Sainte Claire, Inc., Marysville, Mich., it has been announced. Mr. Andrews will serve as traveling sales representative on general assignment, working directly under orders from Marysville. He is a veteran of automobile sales and has served with the Autocar, Maxwell, Hudson and Liberty organizations.

J. A. QUEENEY, for ten years connected with the Boston Elevated Railway and formerly with the railway department of the General Electric Co., at Schenectady, N. Y., has become personal assistant to THOMAS E. MITTEN, chairman of the directors of the Philadelphia Rapid Transit Co.

WILLIAM S. WALLACE has been appointed manager of the Pittsburgh office of the Burke Electric Co., Erie, Pa.

Obituary

GEORGE MACLAGAN, treasurer of the Garvin Machine Co., New York City, died suddenly Sept. 15 at his home at Mountain Lakes, N. J., following a stroke of apoplexy. Mr. Maclagan was 65 years of age and was well known in the machine tool industry in the East. He had been treasurer of the Garvin Machine Co. since Nov. 25, 1901, and was formerly with McKesson & Robbins, drugs and chemicals. He was a member of the Machinery Club and was active in St. John's Episcopal Church at Passaic, N. J. Mr. Maclagan is survived by three daughters.

LANGDON GIBSON, noted explorer and brother of Charles Dana Gibson, the well-known contemporary artist, died Sept. 5 at Criehaven, Maine, where he was spending the summer. Death was due to cerebral hemorrhage. He was a native of Boston and was 58 years of age. Mr. Gibson up to two years ago, was production manager of the General Electric Co., Schenectady works. He had been associated with that concern for 31 years and was well known throughout the industrial world. He was a man of great activity and vigor, being one of the few members of the Stanton expedition successfully completing the expedition through the Grand Canyon of the Colorado River in 1889. He gained added fame through his accompanying Admiral Peary's second northern expedition to explore and map the northern coast of Greenland.

J. AMORY HASKELL, vice-president of the General Motors Corp. and of E. I. duPont de Nemours & Co. died recently at his home, Red Bank, N. J.

E. CLAYTON GOODWIN, aged 57 years, vice-president of the Fafnir Bearing Co., New Britain, Conn., died recently in that city.

Business Items

The Paramount Machine Co., with a capitalization of $500,000 has been organized in Ashville, N. C. The incorporators are H. P. Eanes, E. E. Reed and E. L. McEniry.

Increased activity after Oct. 1 will be experienced at the Plainfield, N. J., plant of the Bessemer-American Motors Corp. Recently the corporation sold its Philadelphia plant and hereafter both the Besemer motor trucks and the American motor cars will be built at Plainfield.

The Allied Machinery Co. of America has received advice by cable from T. G. Nee, president of the Horne Co., Ltd., Tokio, with which the Allied Machinery Co. of America is closely affiliated, that the entire head office staff in Tokio is safe.

A new department for the handling of equipment and machinery used by contractors has recently been announced by the Fulton Supply Co., of Atlanta, Ga., one of the largest Southern jobbers of machinery and tools. The department is in charge of D. F. Shanahan, well known in the Southern field as an equipment engineer.

J. G. Brill & Co., have delivered a second consignment of 100 new trolley cars to the Philadelphia Rapid Transit Co. Including those previously placed in service the number now in use is 150, of the recent order of 520.

The R. E. Lovekin Corp., industrial advertising, will occupy the sixth floor of the Smith Building, 18th and Market Sts., Philadelphia, after Oct. 1.

The Studebaker Corp., South Bend, Ind., has purchased four Westinghouse new model multiple retort underfeed stokers of the extra long type. They will be equipped with non-clinkering extension sidewall tuyeres and steam operated double dump grates. The stokers will be driven by four Westinghouse Brown-Lipe variable speed transmissions. These transmissions have four speeds forward and one reverse which gives maximum flexibility in operation. Four 150 hp. motors will drive the fans supplying forced draft air. These stokers will be installed under four 1,509-hp. Connelly boilers. An experienced Westinghouse erecting engineer will supervise the installation. This plant will use Indiana coal of about 12,000 B.t.u.

Three more body plant units will be built at the Iron Mountain plant of the Ford Motor Co. at Iron Mountain, Mich., next Spring, it has been announced. This will bring the total to six. When the present Ford construction program is completed, which also includes a chemical plant, about 8,000 men will be on the payroll. The present force is 2,200.

The Wilson Foundry & Machine Co., of Pontiac, Mich., has announced an expansion program costing $1,500,000.

The Carnegie Steel Co. has purchased for its Mingo Junction plant two Westinghouse "SK" motors complete with rails, two drum controllers with grid resistance and two Morse chain and sprockets complete for stoker drive. The motors are totally enclosed.

The Hercules Motor Corp., Canton, Ohio, a new company with capital stock of $300,000 and of which E. A. Langenbach is president and H. H. Timken, chairman of the board of directors, has taken over the plant of the Hercules Motor Co. from E. A. Langenbach who recently purchased it from the receiver.

A deal has been completed whereby Mansfield, Ohio, interests are to take over the Ashtabula Steel Co., Ashtabula, Ohio, formed in 1920 by Ashtabula capital. A new company has been incorporated known as the Ashtabula Sheet Steel Co., the incorporators being W. H. Davey, A. I. Davey, Sam Davey and W. P. Jenkin of Mansfield.

The Canadian Hart Products, Ltd., has been purchased by a number of Hamilton, Ontario, business men who will carry on the abrasive wheel-making establishment as the company has done for the past forty years, the name of the new firm to be the Canadian Hart Wheel Works, Ltd. H. W. Holmes who is president and general manager has had long experience in the United States and Canada. F. J. MacDonnell, who is secretary and sales manager, has also been associated with the Canadian trade for a number of years.

The Canada Car & Foundry Co. has received an order for 3,500 wheels from the Canadian National Railways. This order will be made up in the wheel foundry of the Amherst plant. With this order to hand the foundry will have two months work ahead. The plant at Amherst has finished something like eight thousand wheels for the Canadian National.

Vickery & Vickery, attorneys for the Stockholders' Protective Committee of the Whitney Tractor Co., Port Huron, Mich., have placed on sale the entire machine tool equipment of that plant that is valued slightly in excess of $25,000. The plant will be open for inspection from Sept. 17 to 22 and bids will be received until Sept. 29 by Vickery & Vickery, Cleveland Discount Building, Cleveland, Ohio.

Olds Motor Works Will Expand

More than 1,000 workmen will be added to the payroll of the Olds Motor Works of Lansing, Mich., when present factory alterations are completed, according to John Scott, factory manager, who asserts that one of the most complete shifts ever made at any automobile factory has now been nearly completed, without in the least disturbing the present high production.

Mr. Scott says that the Olds Motor Works has been holding to its production schedule despite the fact that the motor plant has been moved a distance of several hundred yards and the axle plant has also been entirely changed; other departments of the factory have been moved to make room for new enameling ovens and a progressive chain assembly system for the making of engines.

In connection with these expansion plans the Olds Motor Works has added 500 new machines to the engine plant alone and 250 more to the axle plant. Other sections of the factory have been so changed that better paint shop facilities and body making departments will be available.

Activity Resumed in Philadelphia

The general business situation in the Philadelphia district showed improvement this week. There was a general feeling of optimism among manufacturers, who while believing it too early to forecast what the Fall and Winter will bring forth, feel there is hope for an active season.

Machinery and machine tool manufacturers report that orders have increased in the last two or three months, and some announced their business has advanced over the same period of last year. The railroads have been heavy purchasers.

The demand for pneumatic tools has increased, due partly to a large volume of street repair and new work. The demand for general pneumatic appliances is good. Industrial establishments have been quite large purchasers of boilers in the last few weeks. Boiler manufacturers specializing in marine work also have done an active business for the United States Navy.

Good Elevator Business

Elevator manufacturers report a continued satisfactory business, with many calls for industrial elevators as well as passenger equipment for new office buildings.

Scarcity of labor has retarded the construction work on the new locomotive shops of the Pennsylvania R.R. at the Juniata yards. It was hoped to have these shops in operation next Summer, but owing to the inability to obtain competent craftsmen its opening will go over probably until a later date.

Manufacturers of woodworking machinery report a fair demand for their products. Furniture factories have been purchasers. Demand for skilled workers in the machinery line continues good. Display advertisements have been inserted in the daily newspapers for machinists qualified on radial drill presses, boring mills, milling machines, turret lathes, drill presses, etc.

Railroad Revenues During July

Net operating income of the class 1 steam railroads, comprising about 95 per cent of the total rail mileage in the United States, amounted to $84,614,945 for July, according to figures made public by the Interstate Commerce Commission. For the same month last year the net income was $69,320,528.

Total operating revenues for the month, the commission reported, were $535,813,616 against $443,840,164 for July, 1922. The increase in revenues has a counterpart in expenditures, the carriers paying $414,519,968 in operating costs in July, while in the same month a year ago, operating expenses were $341,081,191.

Detroit Business Is Steady

A noticeable improvement in the machine tool market in Detroit has occurred during the past two weeks, due, executives agree, to the resumption of peak production by the various industrial plants in this region.

Recent announcements of changes in models of a number of automobiles have had their influence on the industry in a small way, but an even greater one is looked for as the factories get into the regular Fall swing of production.

According to machine tool manufacturers, there has been less of a slump in the market during the ordinarily slack months of July and August this year than in several years past. They attribute this steadiness in the market to a prevailing effort of industries to substitute high-production labor-saving tools and machinery for that in service for the last several years.

Automotive Activities

Buick, Cadillac, Oakland, Ford and other automobile concerns have started active production of the 1924 models, with a result that a wide-spread change is being made in machinery and tools.

The spread of the 4-wheel brake idea as evidenced by the speed with which the various makes of automobiles are adopting this safety device is likely to prove a boom to the machine tool plants.

Employment after dropping for the two weeks from Aug. 21 to Sept. 4 has once again started to climb, figures of the Employers' Association showing 215,887 employed among its members during the week ending Sept. 11 as against 210,506 for the week before. This is an increase of 5,381.

Building construction, bank clearances, postal receipts, and increased capitalization show substantial increases.

Railroads are hastening their improvements before cold weather comes. Additions to the facilities on a number of lines are being made.

Canada As a Customer of America

Figures and argument contained in an enlightening memorandum upon Canada's trade and industrial relations within the British Empire, which has been prepared by the Government for use at the Imperial Economic Conference, show that the United States is playing a forceful part in the development and expansion of Canada's commerce in addition to being, in the totality, Canada's largest customer.

"So far as Canada's development in the past has been stimulated by external trade, the stimulus has been due mainly to Empire buying, but also largely to United States buying," says the memorandum. "The effect of Empire buying has been chiefly reflected in Canada's huge development of farm lands, while the impetus to the development of Canada's forests, fisheries, and minerals has been due much more to United States buying than any other factor. Thus Empire markets and United States markets are both immensely importants, and, furthermore, are complementary from the standpoint of meeting Canada's needs. Each is essential to Canadian development."

Unemployment Still Great Britain's Most Serious Problem

BY OUR LONDON CORRESPONDENT

THE holiday period having passed, Great Britain resumed work without much change in general conditions. On all sides the approach of Winter is regarded with apprehension, and no immediate solution of the continental problems is anticipated. Rather, in fact, do troubles become accentuated. The dependence to a marked extent of Great Britain on foreign trade needs no emphasis. It is the growth of unemployment that causes worry.

Cost of living figures also show a definite advance. During the past few weeks, owing to seasonal activities, the numbers of the unemployed should have declined, but in fact they have risen, and not merely in one or two industries. The cotton industry of Lancashire, agriculture, and the engineering industry are acknowledged to be in a most unsatisfactory condition, and the depreciation of capital in Lancashire reached, according to one estimate, 100 million pounds during the past year or so. A special committee of the government has had under consideration the unemployment problem with a view, it is understood, to helping in the finance of schemes of a revenue-producing character, but under private control.

UNEMPLOYMENT GRANTS

Some time ago grants were made to cover such work as road-making, which could not be regarded as revenue-producing. The work being entirely insufficient to relieve the unemployment, grants have been made in connection with statutory schemes intended to be of a revenue-producing character, and calling for work in districts where unemployment is particularly bad. According to report, by the latest schemes under consideration financial help may be extended to the cotton industry, engineering and shipbuilding. It is stated that grants amounting to half the interest on loans raised for a period of ten years can be obtained for—"works in respect of which a substantial part of the expenditure will take the form of orders for materials which will give employment in an industry which is seriously affected, though not necessarily in the area in which the work is to be carried out." The arrangement, as suggested above, is to apply, under conditions, to private companies whose object is the pursuit of profits. A considerable number of schemes are under consideration.

FUTURE WORK PROSPECTS

In addition of course we have many extensions being made to the application of electric traction to railways, etc., and the reserve funds the railway companies have accumulated, amounting, according to assertions, to 130 million pounds, are expected to provide work for many of the workless. The job is to persuade the directors of the railways to that end. To particularize, this expenditure is expected to help the machine tool industry which, despite some rose-colored reports, is beyond question in an entirely unsatisfactory condition. Relief is of course sought, and in some cases obtained, in the manufacture of other engineering articles. Even the small tool side, which is at least relatively better off, can provide the spectacle of shops practically closed.

Those people who imagine that the railway companies ought to provide relief to the machine tool maker have so far been disappointed, and a number of them appear to have been under a misapprehension. An idea of the conditions under which new tools will be purchased on behalf of the railway companies has already been given in these columns. Now for the purpose of renewal, and it may be extension, the chief mechanical engineer of each railway has allotted to him by the directors a definite sum of money per annum and, while he can certainly spend this, he cannot go beyond it without the special consent of those who have control of finance. And those officials are apt to be at a considerable distance from the mechanical engineer. In fact the machine tool man often has no opportunity to impress the mechanical engineer himself as he comes in contact with subordinate officials only who certainly have no power to order, whatever they may be able to do by way of recommendation. An estimate of the total buying capacity of the railway shops does not lead to anticipation of much relief to the machine tool maker. Private locomotive building shops are certainly not busy, and present conditions do not suggest the possibility of extension.

An engineering exhibition held at Olympia, London, W., for three weeks ending on Sept. 22, contained very little in the way of machine tools. This is natural, for, quite apart from the unsatisfactory trade prospects, the Machine Tool Trades Association, as usual, placed an embargo on the show, so that members, willing or otherwise, were unable to take part.

Preparation for Japan's Buying

That Japan will eventually be in the market for many new machine tools and machinery, most of it of the latest improved type and also for much electrical goods is the general opinion expressed at the New York offices of Japanese exporters and importers. Just when the stricken country will be ready to receive these tools is very uncertain and any attempt to place a definite date was considered by these firms as pure guess-work. However, it is safe to assume, according to these merchants, that as soon as the people have been taken care of, the buildings fairly well along toward completion and the necessity for replacement been made apparent, the orders will come rapidly.

Every effort is being made by the New York offices to get as soon as possible a list of the probable requirements so that a great rush of work will not be thrown on the American manufacturers at one time, but may be distributed over a period of several months. As yet, no specific news has been received from Japan, but advices are expected within the week.

At the office of Mitsubishi & Co. it was stated that iron and steel was being purchased and that they, like the other companies were anxiously awaiting some word from Japan. Mitsui & Co., one of the largest firms in the world, stated that in all probability ordering of some machinery would start within a month and that within three months it could be pretty well ascertained what would be needed. At the New York offices of the Andrew & George Co. it was stated that wood working machinery, road building machinery, cement mixers and structural steel would be the first orders placed with electrical goods, wiring, brass and copper and machine tools following, but that it was much too early to even think of anything of a definite nature. At other offices the statements were along the same lines.

Increased Trade in the South

There has been a considerable improvement in machinery and machine tool sales among the Atlanta, Ga., dealers and jobbers since the first of September, and though it is impossible to give definite figures representing the increase, most of the larger distributors seem agreed that sales the first ten days of September were from 12 to 16 per cent better than the first ten days of August, and that the present outlook indicates the month as a whole will be approximately 15 per cent above the sales volume during August. Two of the larger distributors, in fact, state that their volume the first ten days of the month was approximately one-half the entire August total, and that sales for the period are the best they have been since April.

The principal demand has been for lathes and for various machine tools used by the woodworking industries, the latter being unusually active. This is due to the fact that within the past two or three months there has been a marked activity in the increasing of production facilities by such industries, and they are just now entering the market for such new equipment as they need. Also, it is noted that some prospective purchasers who had been holding off their buying in anticipation of lower prices have concluded that they are not coming in the very near future, and have therefore entered the market.

Inquiries received the past two or three weeks have shown no increase to speak of in number, but a larger proportion of them have been developing business than was the case a month ago.

There has been a material improvement also since the first of the month in foundry and machine shop operations throughout the whole Southeast, and an increase in inquiries from this source has been noted as a result, though most of the buying is being done by the smaller shops, so far as this market is concerned.

The trade in Atlanta is feeling considerably better over the outlook than in a number of months, and nearly all larger dealers agree that the last four months of this year should be almost on a par with the excellent volume of business they were enjoying the first four months of the year.

Better Business Reported from Cincinnati Markets

The machine tool industry in Cincinnati is running about sixty per cent of capacity with orders and inquiries coming in in fair quantities. Many manufacturers report that they are suffering from a temporary dullness caused by the reduction in building operations and by the inactivity of the automobile manufacturers in purchasing equipment. It is expected, however, that the automotive industry will be in the local market shortly and will thereby stimulate production. Even though the present operations of Cincinnati manufacturers is on a somewhat curtailed basis, many firms report that their volume of business is approximately twenty per cent ahead of 1922 which is definite cause for encouragement.

Business on conveying machinery is good with the automotive trade making purchases in sizeable quantities and machine shops also buying goodly amounts. Export trade has been quite a factor with Japan and the Argentine taking several large shipments recently. The sales of conveying machinery during August were considerably ahead of July and far in excess of August, 1922. The railroads, steel mills, and foundries have not been in the market to any extent for conveying machinery lately. The production of planers was about the same during the past month as during July and the early part of August. Inquiries are holding up well, but actual buying is not quite up to the standard. It is anticipated that Mexico will come into the market for planers in the near future. While steel plants and machine shops are not doing much buying of planers, business is far ahead of last year at this time of the year.

There is a temporary lull in the purchase of electrical tools by automotive manufacturers. In fact the electrical tool business is Cincinnati is rather quiet at present, although inquiries remain fair. Orders now being placed are small in volume, indicating conservatism on the part of buyers. Several concerns, however, say that August was ten per cent ahead of August, 1922, and twenty per cent ahead of July of this year.

Slow sales of both radial and upright drills are reported by the Cincinnati concerns manufacturing them. Inquiries have remained fair and prospects for export business to Mexico are bright. Lathes have also slumped to some extent in sales, but it is thought that the railroads are about ready to place some excellent orders for lathes with local manufacturers.

The labor situation in Cincinnati has eased a bit and local firms are better able to secure both skilled and unskilled workmen than they were throughout the past three or four months. Business in the metal trades shows more activity. Numerous small orders are taken as an indication of conservative buying, but in the aggregate they contribute to a good volume. There is an upward price tendency in some steel products. The metal trades are fairly busy in Cincinnati with good prospects for a satisfactory Fall business, according to manufacturers.

Indiana Expecting Busy Fall

Regardless of the fact that actual orders do not show any vast expansion in business in Indiana, the large number of inquiries from all sources are very encouraging both to machinery and tool men here. The story about the "ill wind" holds true yet. Machinery men say they already are getting inquiries, especially from those factories allied with the steel industry for machinery and tools to take care of proposed expansion and increased production due to orders from Japan, the orders following closely in the wake of the earthquake there.

Trade Stimulated

In some lines demand is contracting somewhat, but in others not only are orders up to expectations but running a little ahead. Most of the automobile plants here are operating. None of them is operating anything resembling capacity, but there have been increases in production schedules during the last two weeks and executives say the end of orders is not in sight. The tooling demands in automotive plants seem to be exceptionally heavy. It is pointed out by some that many plants had postponed buying for months and with the exception of emergency orders, no purchases were made, so considerable volume of this business may be expected.

The last two weeks have seen a decrease in demand for machinery for woodworking factories, with the exception of furniture factories. Sash and door and interior finish mills here have about caught up with their orders. Furniture factories report large volumes of orders, however, and predict a steady Winter's production.

There is an increase noted in the volume of coal mining machinery. Mines are beginning to work more steadily as cold weather comes and more machinery of special design is needed. Most mines had been permitted to run down during the slump in the coal market.

Business Steady in New York

Railroad buying and further increases in inquiries are the high spots of the New York market this week. Dealers report satisfaction with the present condition and the future is anticipated with the best of prospects. The Pennsylvania R.R. continued its buying into the week and this was augmented with buying from the Seaboard Air Line and some few orders were also received from the New York Central, New York, New Haven and Hartford and other roads in the East and South. Inquiries are reported from locomotive builders and ship building companies and it is expected that sales will be the result in most cases.

Some buying was noted in the automotive field this week and orders were also received from accessory makers. The prospects in the automobile industry are most encouraging this Fall and dealers are laying their plans for renewed activity within a month.

General industry was not a good purchaser during the week with the exception of single sales here and there.

Exporting Improved

The export business shows some improvement over the past few months and exporters are looking forward to greater improvement with the settlement of the Ruhr trouble and with the gradual return of economic normalcy in Europe generally.

Used machinery dealers can only characterize their business as "fair" with difficulty found in securing the right type of machines in some cases and in the dearth of buyers for popular types of tools in other instances.

Japan Inquiries in Chicago

Machine tool sales and inquiries continue at a low point in the Chicago district, but dealers retain their belief that there will soon be an upward swing. The Illinois Central R.R. and Santa Fe R.R. purchased a few tools recently. No new railroad lists have been issued lately and it appears that the railways have secured most of their machine tool requirements. Second-hand machinery seems to sell more readily than new. An order of 20,000 boxes of tin plate for Japan which has been in the market for several days was closed within the last few days. India is in the market for a substantial tonnage of sheets.

Heavy inquiries for steel are coming into the Chicago market for shipment to Japan. Included are requests for bars, shapes and plates in large tonnages. It was generally believed that the heavier material would not be wanted until later, but according to Chicago mills quite a little is in the present inquiry. Several fairly good inquiries for machine tools have been received.

Railroads Buying Cars

One large railroad system is getting tentative bids on 6,000 cars and another on 4,000. Railroads continue to buy rails in large tonnages. The Louisville & Nashville R.R. has increased its order to 50,000 tons. The Canadian National has ordered 20,000 tons.

The activity of Illinois industries and the good wages paid is causing a migration of workers from other industrial centers. So large has been the influx that the anomalous situation is presented of the state's industries at the peak of profitable employment with some increase in unemployment. The August summary of the Illinois Department of Labor shows that industries increased their working forces 1.3 per cent during the month, bringing employment at 15.8 per cent above a year ago. Chicago had 129 seekers for every 100 jobs. Machinists and other workers in the metal trades are plentiful, but just how long this condition will last is problematical. Manufacturers still have fresh in their memories the shortage of men last Spring.

The Industrial Review

How the makers of machinery and machine tools are finding business conditions and how the future looks—Steady Improvement anticipated in all parts of the country

THE prospects for the Fall season in the machine tool industry are considered good and from all parts of the country come reports to the effect that many more inquiries are being received than is usual at this time of the year. While inquiries do not necessarily mean future business they offer the best barometer that the dealers and makers may go by. If a fair portion of the inquiries that have come in result in business, dealers say that a year described as "better than usual" will be the result.

Business in the industry during the first four months of the year was good and this was followed by a period of quietude caused by the Summer seasonal dullness and also by a note of caution that was sounded at about this time and was obeyed by buyers in every line of business. Recovery from both the Summer and the caution has been effected now and reports are coming in of better conditions in nearly all lines.

Not all machine tool builders are busy, however. One will find here and there direct set-backs to the note of optimism. Factories working overtime and factories working in three eight-hour shifts are to be found in the same localities as factories that are virtually shut down for lack of orders. It is no local trouble as this condition is true in every part of the United States. New England is having its troubles as well as Milwaukee, Cincinnati, Chicago and other centers of the industry. But the consensus of opinion is that machine tool builders generally are in a better condition this year than they were last year.

Electrical Business

Reports from the electrical field prove very interesting. Power equipment is being purchased at a rate that has long since passed the peak of the war production. Bigger projects than were ever before attempted are in the course of construction and orders are being placed almost daily in every part of the country. This indicates that companies furnishing power are convinced that business is to move forward during the coming months with added strength and are willing to back their belief by investing dollars in adequate equipment to produce that power.

Electric control equipment factories are all working at near capacity at the present time which is unusual for this season. The production of motors is good, but the sales have been slightly under expectations, it is said. This statement is supplemented, however, with the explanation that motor equipment is the last installation in a new building as a rule and the building program this year has been delayed in completion due to labor troubles. Motor manufacturers are confident of better business after Sept. 1, it is asserted.

The General Electric Co. has announced that within a short time it will have more men on its payroll than it had at any time during the war which was the record enrollment in its history.

Street Railways Buying

During the first six months of the year more street railway cars were purchased than during the entire twelve months of 1922. In fact, the first half of the year has furnished a record in the history of street car railroading. New equipment in car houses and repair shops has been purchased steadily since the first of the year. As an indication of what is doing in this line, the Philadelphia Rapid Transit Co. has recently announced that it will build a new car house and repair shop to cost $1,300,000, and similar reports are being received from every part of the country.

The traction company at Fort Wayne, Ind., will spend over a million dollars on improvements and the Boston Elevated Co. is also reported as prepared to spend a large amount for new equipment.

Watch Bus Transportation

Bus transportation is another line of travel that is seriously entering into the field of activities and machine tool makers would do well to keep an eye on this branch and to cultivate the growing trade that is being developed. There are now approximately fifty thousand passenger buses in the United States. Some of these are individually owned, while others are operated in fleets of from five to a hundred. Investigation shows that where more than five are owned by one company or individual not only light repairs but heavy repairs requiring machine tools are done by the owners themselves in their own machine shops. And in many cases it has been found that individuals have "pooled" their interests and established their own repair shop. At the present time such a project is on foot in New Jersey where sixty buses will be repaired in one shop.

Also to be noted is the fact that in every part of the United States factories for the manufacture of buses are established.

Building Records

Here are some figures of importance to the machine tool industry, although not directly affecting it. Industrial building during the month of April, which was the high point this year, was twelve million dollars greater than the average for the past three years. That was last April. Now the buildings are ready for occupancy and to receive new equipment and machines. While this was exceptional, it does not mean that there has been a slump since April in industrial building. The chart curve shows that the record has stayed above the three-year average since that time and is today higher than it has been for any August since the war. Also it is well to remember that this is in the face of higher costs of building.

The total construction in the United States last year was four and a half billion dollars. During the first half of 1923, building totaled three billion dollars. Figures further show that renewed activity in building has been recorded this September following the usual decline of permits in Summer.

Mining Activities

Increases in the mining industry are noted in several different sections of the country, notably in the Northern Ontario district. In the Porcupine region the Hollister Gold Mines, Ltd., is increasing its capacity so that it will have the biggest gold mine in the world.

In the Sudbury nickel country the International Nickel Co. is installing new smelter equipment and other companies are reporting expansion in the same region.

Iron mining in Minnesota is in excellent shape and reports from the iron ranges state that the miners expect to ship between 50 and 55 million tons of iron ore to the steel districts during the shipping season on the Great Lakes.

Coal Situation

Now that the strike in the anthracite coal regions has been settled and a season of work is ahead, it can safely be said that the coal mine operators are in a better position to buy machinery than ever before. The bituminous mines are generally in excellent shape and recent reports from the United States Geological Survey show that record weeks in production have resulted and that the prospects for the coming Winter are most encouraging. All records were broken recently in both fields when there were mined 2,165,000 tons of anthracite and 11,346,000 tons of bituminous.

Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars..	per lb....	$0.0337	$0.0337	$0.0285
Cold finished shafting.....	per lb....	0.0433	0.0428	0.0373
Brass rods.....	per lb....	0.17	0.1741	0.1666
Solder (½ and ½)	per lb....	0.276	0.276	0.2283
Cotton waste...	per lb....	0.1225	0.1231	0.1458
Washers, cast iron (⅛ in.)...	per 100 lb.	4.66	4.66	4.00
Emery, disks, cloth, No. 1, 6 in. dia.....	per 100...	3.08	3.08	2.96
Lard cutting oil	per gal...	0.575	0.575	0.575
Machine oil....	per gal...	0.349	0.349	0.36
Belting, leather, medium.....	off list....	37%	37%	44½%
Machine bolts up to 1x30 in.	off list....	49½%	44¼%	53½%

The Business Barometer

This week's outlook in Commerce, Finance, Agriculture and Industry based on current developments

By THEODORE H. PRICE
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EARLY last week the markets reflected the relief generally felt at the disappearance of the political clouds which had hung over Europe for so long. But on Wednesday a mild reaction set in, and at the week end the price level of speculative stocks and commodities was slightly lower than at the week's commencement.

This record is in accordance with precedent, for many professional speculators make it a rule to sell on good news, and however sound and prosperous conditions may be it is never to be expected that prices will move continuously in one direction.

There is, however, no change in fundamental conditions. Emboldened perhaps by his success in bullying defenseless Greece, the Italian Premier, Mussolini, is shaking his fist at Jugo-Slavia, and the Captain-General of the Spanish army at Barcelona is threatening to lead the troops under his command in an attack upon King Alphonso's government unless the present Cabinet is removed.

But neither the American nor the European markets have been much affected by the political bluster that seems to have become a habit with the Latin peoples of southern Europe. It may perhaps explain why the scenes of so many comic operas are laid in Italy or Spain, but it is not regarded as otherwise important, and day by day more pessimists are being converted to optimism.

The probability of a general advance in prices is in fact becoming so evident to so many people that some bankers are already talking about inflation and how to prevent it, but after the experience of 1921 and the criticism to which the Federal Reserve Board was then subjected it is unlikely that the mistakes of that year will be repeated. In any event we are a long way off from the time when the repression of commercial activity by credit restriction will be necessary, for as Shepard Morgan, Assistant Federal Reserve Agent at New York, says:

"The increase in bank loans and investments throughout the country is estimated at $3,500,000,000, and the increase in deposits over 1921, both demand and time, is estimated at somewhat more than $4,000,000,000.

"But the immense increase in bank loans and deposits involved no increase at all in the use of Federal Reserve Bank credit.

"This was true even though the total bank deposits of the country, reflecting a very large volume of loans and investments, reached a level nearly two billions higher than at the maximum of credit expansion in 1920, when the banks were deeply indebted to the Federal Reserve banks.

"At that time, when the amount of gold in the country was about a billion less than at present, the banks borrowed heavily from the reserve banks in order to provide themselves with currency and the necessary reserves against their deposits. The contrast between the present and the 1920 period of expansion is clearly marked—now a very moderate employment of Federal Reserve credit—then employment almost to the legal limit."

The weekly statement of the Federal Reserve System bears out the foregoing, for it shows an increase of $8,651,000 in the gold held, an increase of $30,000,000 in member banks' deposits and a reserve ratio of 75.9 as against 76.4 per cent last week.

> "But neither the American nor the European markets have been much affected by the political bluster that seems to have become a habit with the Latin peoples of southern Europe. It may perhaps explain why the scenes of so many comic operas are laid in Italy or Spain, but it is not regarded as otherwise important and day by day more pessimists are being converted into optimists."

In detail the stock market has been quiet, with some weakness in the oil shares and an antithetical strength in the stocks of most of the railway companies. Apparently the leaders of the oil industry are somewhat depressed at the over-production of petroleum and the decline in the value of gasoline, while the public are commencing to realize that the large railway traffic must sooner or later be reflected in the prices of railway shares.

In the bond market there has been some decline in the prices of municipal bonds and other tax exempt securities, largely because of Secretary Mellon's persistent advocacy of another reduction in income supertaxes which will of course lessen the desirability of tax exempt bonds as an investment for the very rich.

In the commodity markets there are but few changes to report. After advancing to well above 28 cents cotton futures have reacted slightly as was to have been expected, and wheat is also a shade easier as the magnitude of the Canadian crop is being brought into relief. Sugar has been firmer upon reduced crop estimates and coffee has shown no little strength, reflecting the inflationary prosperity reported from Brazil as the gold value declines.

As the news from Japan indicates that the silk producing districts were not much injured by the earthquake the market for raw silk has become a little less hysterical and trading has been resumed at prices which are reported to be very much above those current before the Japanese catastrophe. The steel industry has been somewhat disappointed at the non-receipt of expected orders from Japan, but reasonable activity prevails and there is a good demand for railroad as well as structural steel.

A decided revival in building is reported, especially in New York, where the plans filed during the month of August show an increase of 56 per cent over last year in the expenditures contemplated. For the whole country the increase, as shown by the plans filed in 150 cities, is 13 per cent over last year. Copper continues to be the only laggard among the metals. It is still below 14 cents, chiefly as a result of the small export demand.

As Germany shows a tendency to parley with France for a settlement most of the foreign currencies have improved in value, but although marks are nominally quoted at the fantastic price of one dollar per hundred million they are practically worthless and sterling and dollars are gradually displacing them as currency in Germany.

In the dry goods trade a fair distribution is reported, but retail sales continue large and there is no accumulation of stocks anywhere. The indications are therefore in favor of a sustained and reasonable activity.

The foreign trade figures for August show merchandise exports valued at $313,000,000 and imports valued at $275,000,000. The excess of exports for the month is $38,000,000 as compared with $20,000,000 last year. But for the 8 months ending August 31 there has been an excess of imports over exports amounting to $88,000,000. Net imports of gold for August were $30,600,000 as compared with $27,000,000 in July.

Surplus Freight Cars in Good Condition

Despite the fact that loading of revenue freight for the week of Sept. 1 amounted to 1,092,567 cars, the greatest number for any one week in history, the railroads of the United States had on that date 66,559 surplus freight cars in good repair and immediately available for service if required, according to reports filed by the carriers with the Car Service Division of the American Railway Association. Reports also showed that on that date the reported car shortage amounted only to 9,441 cars for the country as a whole.

The number of surplus freight cars was a decrease of 8,358 since Aug. 22, while there was an increase during the same period of 1,751 in the reported car shortage.

Car Loading Breaks Another Record

A new record in car loadings was again reported by the American Railway Association for the week ended Sept. 1, with a total of 1,092,567 cars. This is 22,635 more cars than the previous record made in the week ended Aug. 25, and is approximately 74 000 cars more than the high record of 1920, established in the week ended Oct. 14.

This figure exceeds by 10,000 cars the peak freight movement anticipated by the association earlier in the year, and is 82,000 more cars than was estimated for the last week in August. The record also was an increase of 168,761 cars over the same week of last year, and 261,279 more than for the same week two years ago.

A new high record also was established in the number of cars loaded with merchandise and miscellaneous freight, considered by many as a criterion of general business conditions. The total in this classification amounted to 622,-710 cars. This was an increase of 16,605 cars over the preceding week.

This is the twelfth week this year that the million car loading mark has been passed, and in eight of the twelve weeks the total exceeded the record established during the week of Oct. 14, 1920.

Steel Buildings Damaged Least by Quake

American steel and concrete buildings in Tokio and Yokohama withstood the earthquake shock and are in good condition, according to a cable from Assistant Trade Commissioner G. C. Howard at Kobe. Officials of the Department of Commerce expresse! gratification over the first practical demonstration of the effectiveness of the new so-called earthquake-proof factories and office buildings which have been constructed within the past three years. There are about six of these buildings in Tokio. The fact that this construction has proved earthquake proof is likely to influence favorably the adoption of this type of construction in the future.

The Assistant Trade Commissioner also cables that export as well as import shipments probably must be made via Kobe for some time. Kobe, on the Inland Sea, is 200 miles outside the devastated area. It is the chief import center of Japan and is surpassed only by Yokohama in export trade.

Railroads Purchasing Steel Rails

Railroads are displaying more interest in the purchase of steel rails and other finished products, according to reports in the steel trade. The Canadian National Railways has just let a contract to the Illinois Steel Co., a subsidiary of the United States Steel Corporation, calling for delivery in 1924 of 23,000 tons of rails. The rails will be used on the Grand Trunk lines in this country. The order was the largest received during the last week, but in the aggregate all companies have received contracts calling for delivery of between 75,000 and 100,000 tons of rails.

Buying on the part of the railroads is still the outstanding feature in the market and this is expected to continue for the remainder of the year, according to steel trade officials. They expect that the carriers will soon lay plans for locomotive and other equipment requirements for the new year and anticipate contracts in connection with such needs.

Erie R.R. Orders Many New Cars

Forty-four new suburban cars costing $1,000,000, which have just been ordered by the Erie R.R., will be placed in the commuting service inbound to and outbound from Jersey City before the end of the year as a part of the program of the Erie to use heavier locomotives and longer trains. It was announced that twenty-five Pacific type locomotives had just been allocated to this service. In addition twelve "K" type engines have been delivered and will be used in the service.

The new cars will accommodate eighty-six passengers each, giving an additional capacity of 3,784 persons, to handle the rapidly increasing commutation business to and from New York City. The cars will be of the most advanced type of construction, it was stated recently, having an average weight of but 1,000 pounds to each passenger space.

The heavier locomotives are being obtained as the result of the new equipment being installed on the main line by the Erie. These locomotives have resulted in an increase in the length of the run in some cases to 180 to 200 miles. This in turn has made it possible for the Erie to turn back into the commuter service some of the Pacific type locomotives.

Navy Department Will Sell Battleships

The navy department announces that 21 battleships and battle cruisers will be eliminated from the United States Navy in accordance with the terms of the treaty for the limitation of armament. The battleships will be sold for salvage under sealed proposals each ship to be sold as a whole and to be scrapped by the purchaser within eighteen months from the date of ratification of the treaty, which became effective Aug. 17. The vessels are to be sold in four lots, the sales to be held and bids opened on Oct. 25, Nov. 1, Nov. 8 and Nov. 30. All bids should be addressed to Officer-in-Charge, Sale of Naval Vessels, Room 1,008 Navy Department, Washington, D. C.

More Rails for the Pennsylvania

The Pennsylvania R.R. has placed orders for 20,000 tons of rail to be delivered during the remaining months of 1923, it was announced. The order has been divided equally between the Bethlehem Steel Corp. and the Carnegie Steel Co.

This order with the 118,171 tons that the Pennsylvania has already ordered for delivery in 1923 will make a total of 138,171 tons of rails that have been purchased by the system.

Reports in the railroad district, which were not confirmed by the Pennsylvania, were to the effect that the Pennsylvania would be back in the market shortly to place orders for between 150,000 and 200,000 tons of rail which it is planning to use in its improvement work in 1924.

Other additions to the tonnage have been made by various roads recently. Among them is the Louisville & Nashville, which, according to reports, has increased its order with the Tennessee Coal, Iron & Railroad Co. by 20,000 tons, making the total placed 50,000 tons.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Automotive accessories. Weltevreden, Java. Purchase. Reference No. 7678.

Ice-manufacturing plant, 40-ton, driven by a semi-Diesel engine. Colombo, Ceylon. Purchase. Reference No. 7662.

Bids are invited on the following railway equipment which the railways department of the State of Victoria, Australia, desires to purchase:

Two ½-in., seven 1-in. and two 3-in. die heads, including all necessary equipment. Tenders to close at 11 a.m. Oct. 17.

Two 1-ton capacity electric hoists complete with trolley wires and current collectors. Tenders close at 11 a.m. Oct. 24.

"Four-sided" type, high-speed, woodmo'ding machine, capable of molding both hardwood and softwood up to 9x4 in. on four sides in one operation at high rates of feed. The machine must be complete with all accessories. Tenders close at 11 a.m. Oct. 31.

Specifications covering this material may be consulted by interested manufacturers at the district offices in New York, Chicago and Philadelphia of the Department of Commerce.

Forthcoming Meetings

New Haven Branch of the American Society of Mechanical Engineers. Third annual machine tool exhibit Sept. 18, 19, 20 and 21. Mason Laboratory, New Haven, Conn. A. C. Jewett, chairman.

Association of Iron and Steel Electrical Engineers. Iron and steel exposition, Buffalo, Sept. 24 to 28. John F. Kelly, secretary, Association of Iron & Steel Electrical Engineers, 708 Empire Building, Pittsburgh, Pa.

National Safety Council. Twelfth annual congress at Buffalo, N. Y., Oct. 1 to 5. All meetings will be held at the Statler Hotel. Headquarters, 168 No. Michigan Ave., Chicago, Ill.

American Society for Steel Treating. Annual convention at Pittsburgh in connection with the International Steel Exposition. Oct. 8, 9, 10, 11 and 12. W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio, national secretary.

Society of Automotive Engineers. Production meeting at Cleveland, Ohio, Oct. 25 and 26. Headquarters, 29 West 39th St., New York City.

American Gear Manufacturers Association. Fall meeting. Mountain House, Lake Mohonk, N. Y. Oct. 25, 26 and 27. T. W. Owen, secretary, 2,443 Prospect Ave., Cleveland, Ohio.

American Management Association. October 29, 30, and 31, Hotel Astor, New York City.

National Exposition of Power and Mechanical Engineering. Second annual exposition to be held at the Grand Central Palace, New York City, Dec. 3 to 8. Headquarters, Grand Central Palace, New York City.

New and Enlarged Shops

Machine Tools Wanted

Ala., Gadsden—Eureka Fdry. Co.—drill press and lathe.

Ill., Elgin—H. Burge, 280 Grove Ave.—air compressor, gasoline tanks, pumps, drill press and one small lathe for garage.

Ind., Lafayette—J. F. Horner Automobile Co., 19th and Columbia Sts.—drill press and lathe for proposed $40,000 garage.

Minn., Minneapolis—Minnehaha Welding & Machine Co., 3750 Minnehaha Ave., C. G. Scharf, Purch. Agt.—one cylinder boring machine.

Mo., Joplin—E. N. Cunningham, 606 North Moffat St.—emery stamp and one lathe, 7 x 14 in. swing.

Mo., Joplin—Hamm Mchy. Co., 209 Virginia St.—tool post grinder, crank shaft tool grinder, expansion reamer, milling attachment for 16 in. lathe, also piston grinder.

Mo., Joplin—McNeil Mchy. Co., 3rd and Joplin Sts.—Mitts & Merrill No. 4 keyseater.

Mo., St. Louis—C. Bleisch, 3325A California Ave.—lathes, drills, etc., for garage at 3348 California Ave.

Mo., Webb City—Bartlett's Garage, 222 North Madason St., N. R. Bartlett, Purch. Agt.—drill press (used).

Mo., Webb City—Burwick's Garage, 201-3 South Main St., A. H. Burwick, Purch. Agt.—regrinding machine and 18 in. American lathe.

Mo., Webb City—West Side Machine Co., 224 North Madason St., W. H. Tholborn, Purch. Agt.—key seater and turret lathe.

N. J., Jersey City—Bertolette Machine Tool Co., 357 West Side Ave.—one Blanchard, also one Pratt & Whitney vertical grinder.

N. Y., Alabama—G. Cook—equipment for proposed machine shop at Fullers Pond, Batavia.

N. Y., Buffalo—G. Bruiknern, 1471 Hertel Ave.—equipment for garage and repair shop.

N. Y., Buffalo—M. Buehler, 126 Leroy Ave.—equipment for garage and repair shop at 19 Brewster St.

N. Y., Buffalo—F. H. Chilson, 302 Auburn Ave.—equipment for garage and repair shop on Auburn and Grant Sts.

N. Y., Buffalo—J. K. Fisher, 1095 Sycamore St.—sheet metal machinery.

N. Y., Buffalo—C. J. Joslyn, 161 Huntington Ave.—equipment for garage and repair shop on Huntington and Parker Aves.

N. Y., Buffalo—J. A. Markett, 157 West Tupper St.—equipment for garage and repair shop at 3417 Bailey Ave.

N. Y., Buffalo—L. Patrick, 555 Abbott Rd.—equipment for garage and repair shop at 1056 Abbott Rd.

N. Y., Buffalo—C. S. Rowley, 20 Thatcher Ave.—equipment for garage and repair shop, also one 1,000 gal. gasoline tank and pump.

N. Y., Salamanca—Rodman Auto Supply Co., Main St., R. Lawson, owner—equipment for proposed service station.

O., Columbus—E. P. Cott Mfg. Co., 286½ North Front St. (manufacturer of counter brackets)—grinder and drill press.

O., Columbus—Joseph's Garage, Oak St. and Champion Ave., F. F. Pierce and H. Shipley, Purch. Agts. — machinery and equipment for machine shop and service station.

O., Fostoria—W. J. Hakes—equipment for $50,000 garage and service station.

O., Sandusky—Union Chain & Mfg. Co.—punch presses, 5 to 6 in. stroke.

O., Toledo — Toledo Metals Mfg. Co., Cleveland and Michigan Sts., J. M. Sawhill, Treas.—machinery and equipment for proposed metal manufacturing plant, to replace that which was recently destroyed by fire.

Okla., Picher—C. R. Curzan, 310 Netta St.—machinist's vise, electric drill, emery wheel, stand and lathe for garage.

Okla., Picher—E. T. Harris, Netta St.—blacksmith's tire shrinker and drill press.

Okla., Picher—Netta St. Garage, J. McUle, Purch. Agt.—lathe (used).

Okla., Picher—Standard Mchy. & Supply Co., West A St.—lathe, drill press, emery stand and wheel (used preferred).

Okla., Picher—Wise Welding Wks., Connell Ave., L. R. Wise, Purch. Agt.—grinding machinery, machinist's lathe, emery wheel and stand (used).

Pa., Phila.—Miller Lock Co., 4530 Tacony St.—toggle jointed 200 to 250 ton capacity embossing press, stroke of not less than 2 in. (used).

Pa., Wilkes-Barre—J. Bergan, 221 Lincoln St.—equipment for garage and service station.

Pa., Wilkes-Barre—V. Purdsminici, 86 Seneca St.—garage and repair equipment.

Tenn., Memphis—Pilcher Printing Co., 54 North 2nd St.—machinery and equipment for new plant at 33 Beale Ave.

Va., Norfolk—Taylor-Parker Co., Water St. and Commerce Pl., C. A. McLean, Purch. Agt.—medium size milling machine, universal or plain (used).

W. Va., Logan—Guyan Machine Shops—heavy duty milling machines or gear cutters, also portable hoists, electric, steam or belt driven.

Wis., Manitowoc—E. W. Krug Mfg. Co., 918 South 19th St.—equipment, small tools, belting and shafting for proposed machine and repair shop.

Wis., Milwaukee — J. H. Knaup, 1524 Galena St.—20 in. drill press, tool room lathe, emery grinders and air pump for garage.

Wis., Poskin—D. & H. Sure Grip Brake Co., A. Delegard, Mgr.—special machinery, drill presses, lathe, belting, shafting and hoists for proposed $50,000 factory.

Wis., Racine—M. Hamnes and L. J. Boiman—shop equipment for the manufacture of automobile headlight deflector devices.

Wis., South Milwaukee—Milwaukee Tool & Forge Co., G. Haubert, Purch. Agt.—medium size steam hammer and several heavy duty grinding machines.

Que., Montreal — H. Rayment, 412 1st Ave.—complete equipment for garage.

Que., Sutton—R. Martin, Main St.—garage and repair shop equipment.

Machinery Wanted

Calif., Sacramento — County of Sacramento, H. W. Hall, Clk.—receiving bids until Sept. 24 for refrigerating plant in county hospital.

D. C., Wash.—Dist. Comrs.—receiving bids until Sept. 25 for print shop equipment and woodworking machinery for the Eastern Junior High School.

D. C., Wash.—A. L. Flint, Genl. Purch. Officer of the Panama Canal—receiving bids until Sept. 24 for insulated wire and cable, steel conduit, oil pump, breast and hand drills, punches, tinner's shears, pulleys, etc.

Ga., Atlanta—J. M. Torrence 170 Trinity Ave.—machine for the manufacture of hammer handles.

Ia., Dubuque—The city, O. E. Carr, City Hall, Mgr.—one traveling crane, hand or electrically operated.

Kan., Wellsville—Globe—10 x 15 in. job printing press.

Ky., Louisville — St. Joseph's Infirmary, 4th St.—complete equipment for proposed $60,000 laundry.

La., Monroe—Acme Carbon Mfg. Corp., Ouachita Natl. Bank Bldg.—equipment for proposed plant.

La., New Orleans—Banner Dye House, 815 Camp St.—$65,000 worth of equipment for drying section of proposed cleaning and dyeing house.

Mass., Newton (Boston P. O.)—Security Mills, Inc.—Payne winders and bottle bobbins for same.

Mass., Ware — School Bd. — wood and metal working tools and machinery for proposed $160,000 junior high school.

Mo., Joplin—Joplin Leather Co., 10th and Main Sts., J. Axel, Purch. Agt.—sole fastener, heel slugger, patching machine, combination skiver and sole cutter, also leather stitching machine.

Mo., Joplin—Laupher Motor Co., 9th and Joplin Sts., E. Smith, Purch. Agt.—connecting rod aligning machine.

Mo. Joplin — Waggy Auto Service 210 East 5th St. W. C. Waggy Purch. Agt.—electric drill (used).

Mo., Kansas City—G. Lee, 422 Blue Ridge St.—power leather stitcher.

Mo., St. Louis—J. Sharpo, Room 2, 620 Chestnut St.—7 x 11 in. Pearl press or 8 x 12 in. Chandler & Price press.

N. J., Newark—Riverside Steel Casting Co., Plank Rd. and Passaic River—one 10 ton, 40 ft. span electric traveling crane with cage 220 volt d.c.

N. Y., Buffalo—Art Work Shop, 828 East Ferry St. (manufacturer of automobile hardware, vanity and smoking cases), W. J. Pierce, Secy.—small drop hammer and cutting machines for proposed small addition to factory.

N. Y. Buffalo—J. C. Breker, 132 Spruce St.—equipment for light manufacturing and metal plating.

N. Y., Buffalo—F. M. Clapps, 154 Massachusetts Ave.—equipment for proposed bakery at 408 7th St.

N. Y., Buffalo—J. O. Guercio, 312 Front Ave.—equipment for bakery on North Ogden and Ludington Sts.

N. Y., Buffalo—J. Dodge, 361 Parkdale Ave.—tinsmith machines.

N. Y., Buffalo—C. Owen, 85 Englewood Ave.—equipment for the manufacture of confectionery.

N. Y., Buffalo—G. J. Sanford, 632 West Ave.—equipment for small factory for the manufacture of potato chips, at 651 West Ave.

N. Y., Niagara Falls—Niagara Ammonia Co., Buffalo-Columbus Ave.—equipment for plant.

N. Y., Syracuse—Chemical Toilet Corp., Liverpool Rd.—upright can closing or seaming machine for 20 in. diameter, 22 gage and lighter (used).

N. C., Durham — Durham Service Co., 215 East Main St.—floor polishing machine for tile floors.

N. C., Raleigh — Walker & Jones, 511 Tucker Bldg. (machinery dealer)—electric portable mortiser.

O., Cleveland—The city, c/o G. Beckwith, City Hall—receiving bids until Sept. 28 for one portal pier locomotive crane.

O., Columbus—Tri-State Brick, Tile & Coal Co., 16 North 3rd St., W. Klein, Van West. Purch. Agt.—tipple machinery for coal mine near Ironton; also brick making machinery.

O., Massillon—Reynolds Machine Co., O. T. Benford, Purch. Agt. — screw driving machine.

O., Toledo — J. Meister, 838 Bway. — laundry equipment to enlarge plant.

Pa., Phila.—H. J. Homan Co., 1713 Chestnut St. (contractor), C. Fleming, Purch. Agt.—refrigerating machinery, tools, oil and water tanks.

Pa., Pittsburgh—Gulf Refining Co., Frick Annex—two 15 ton, 3 motor, 45 ft. span electric cranes for Port Arthur, Tex.

Pa., Pittsburgh—Pennsylvania Casting & Machine Co., Keystone Bldg.—one 3 ton crane.

Pa., Wilkes-Barre—M. Blazejewski, 411 North Main St.—equipment for proposed additions to bottling works.

Tenn., Chattanooga—M. B. Parker—electric welding outfit.

Tenn., Nashville—Southern Portland Cement Co., 313 Independent Life Bldg.—complete equipment for large plant, to be purchased in a few weeks.

Tex., Dawson—Dawson Hardware Co.—tinner's brake, hand tools and riveter.

Tex., Fort Worth—Ritchie Branch, 110 North Commerce St.—power sticker for job printing.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Iron and Steel—Pig-iron market tending downward since settlement of coal strike. Furnaces piling iron, preparatory to going out of blast until demand improves. Structurals very firm at $2.50 base. Car material demand strong and plate shipments improved. Structural demand also increased, principally for schools, commercial and residential buildings and bridge construction. Bars stronger; buying active, particularly in cold finished material. Bulk of present steel business in sheets and tin plates.

Advances—Black and galvanized steel sheets advanced 15c. per 100 lb. in New York warehouses, effective Sept. 1. Tin plates also higher. Babbitt metal up 2 to 4c. per lb. in Cleveland warehouses. Dealers' purchasing prices of old metals (non-ferrous) higher in Cleveland and Chicago. Lead market active; prices tending upward.

Declines—Electrolytic copper dropped ¼c. per lb. in week, at New York warehouses; zinc down 30c. per 100 lb. Tin tending downward; buying more active. Lead and tin most active metals so far as buying is concerned.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$28.05
Northern Basic	25@26
Southern Ohio No. 2	26.00
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	31.00
BIRMINGHAM	
No. 2 Foundry	24.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	26.75
Virginia No. 2	30.17
Basic	26.00
Grey Forge	25.00
CHICAGO	
No. 2 Foundry local	27.00
No. 2 Foundry, Southern (silicon 2.25@2.75)	30.01
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	26.90
Basic	26.90
Bessemer	27.90

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.75
Cleveland	6.75@7.40
Cincinnati	7.50
New York	5.50@7.00
Chicago	5.00@5.50

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	3.00	4.59	3.75	4.15
No. 12	3.10	4.64	3.80	4.20
No. 14	3.20	4.69	3.85	4.25
No. 16	3.40	4.79	3.95	4.35
Black				
Nos. 17 and 21.	3.70	4.95	4.45	5.05
Nos. 22 and 24.	3.75	5.00	4.50	5.05
Nos. 25 and 26.	3.80	5.05	4.55	5.10
No. 28	3.85	5.15	4.65	5.20
Galvanized	**Pittsburgh**	**New York**	**Cleveland**	**Chicago**
Nos. 10 and 11.	4.00	5.15	4.70	5.35
Nos. 12 and 14.	4.10	5.25	4.80	5.45
Nos. 17 and 21.	4.40	5.55	5.10	5.75
Nos. 22 and 24.	4.55	5.70	5.25	5.90
No. 26	4.70	5.85	5.50	6.05
No. 28	5.00	6.15	5.80	6.35

WROUGHT PIPE (Welded)—The following mill discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	62	50½	⅜ to 1¼	30	13
		LAP WELD			
2	55	43½	2	23	7
2½ to 6	59	47½	2½ to 4	28	13
7 and 8	56	43½	4½ to 6	28	13
9 and 10	54	41½	7 to 12	26	11
11 and 12	53	40½			
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	60	49½	¾	28	12
2 and 3	61	50½	1 to 1½	30	14
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	53	42½	2	23	9
2½ to 4	57	46½	2½ to 4	29	15
4½ to 6	56	45½	4½ to 6	28	14
7 and 8	52	39½	7 and 8	21	7
9 and 10	45	32½	9 to 12	16	2
11 and 12	44	31½			

Warehouse discounts are as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	48%	34%	55½%	43½%	50%	37%
2½ to 6 in. steel lap welded	44%	30%	53½%	40½%	47%	34%

Malleable fittings: Classes B and C, banded, from New York stock sell at list plus 15%. Cast iron, standard sizes, 17½% off.

SEAMLESS STEEL TUBING—Following base discounts are on 20 gauge or .035-in., round, cold-drawn tubing, ½-in. to 1-in., O.D., weighing 0.17 lb. to 0.36 lb. per ft. Cutting charge per 100 cuts, $1.50 to $1.58:

O.D. Inches	List Price per ft.	Differential Discount	O.D. Inches	List Price per ft.	Differential Discount
½	$0.09	50%	⅞	$0.16	35%
⅝	.11	45%	1	.18	31%
¾	.14	40%			

NOTE—The discounts are to be lowered by the following differentials in the case of regular .10-.20 carbon: 25,000 ft. or over, 83; 15,000 to 25,000 ft., 82; 5,000 to 15,000 ft., 81; 1,000 to 5,000 ft., 80; less than 1,000 ft., 79.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	7.00	6.00	6.00
Coppered Bessemer rods (base)	6.53	8.00	6.55
Hoop steel	5.19	4.66	4.55
Cold rolled strip steel	7.50	8.25	7.25
Floor plates	5.80	5.66	5.80
Cold finished shafting or screw	4.65	3.90	4.55
Cold finished flats, squares	5.15	4.40	5.05
Structural shapes (base)	3.64	3.46	3.40
Soft steel bars (base)	3.54	3.36	3.20
Soft steel bar shapes (base)	3.54	3.36	3.20
Soft steel bands (base)	4.39	3.61	3.95
Tank plates (base)	3.64	3.46	3.30
Bar iron (3.25 at mill)	3.54	3.36	3.20
Tool steel	11.00	....	....
Drill rod (from list)	55%	40@55%	50%

Electric welding wire, New York, 5/32, 8.35c.; ¼, 7.85c.; 5/32 to ½, 7.35c. per lb.

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York			14.37½
Tin, 5-ton lots, New York			42.50
Lead (up to carlots), St. Louis	6.85	New York	7.37½
Zinc (up to carlots), St. Louis	6.50	New York	6.95

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	26.10	27.00	26.00
Antimony (Chinese), ton spot	8.50	10.50	8.75
Copper sheets, base	22.25	22.00	23.00
Copper wire (l.c.l.)	16.50	19.25	16.25
Copper bars (l.c.l.)	20.75	22.50	19.50
Copper tubing (l.c.l.)	25.50	27.50	23.00
Brass sheets (l.c.l.)	18.50	23.00	18.75
Brass tubing (l.c.l.)	24.00	28.50	20.50
Brass rods (l. c. l.)	16.75	18.50	15.75
Brass wire (l. c. l.)	19.00	23.00	.....
Zinc sheets (casks)	10.25	10.45	.....
Solder (½ and ½), (case lots)	29.50	27.75	20.00
Babbitt metal (83% tin)	52.00	53.00	42.00
Babbitt metal (35% tin)	25.00	17.00	18.00
Nickel (ingot and shot)	29.00	.....	35 00
Nickel (electrolytic)	32.00	.....	35.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel sheet (base)	57.00
Hot rolled rods, Grade "A" (base)	55.00
Cold drawn rods, Grade "A" (base)	63.00
Copper nickel ingots	37.00
Hot rolled copper nickel rods (base)	45.00
Manganese nickel hot rolled rods "E"—low manganese (base)	57.00
Manganese nickel hot rolled rods "D"—high manganese (base)	60.00

Base price of monel metal in cents per lb., f.o.b. Huntington, W. Va.

Shot	32.00	Hot rolled rods (base)	40.00
Blocks	32.00	Cold drawn rods (base)	48.00
Ingots	38.00	Hot rolled sheets (base)	42.00

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.00	11.75	12.00
Copper, heavy, and wire	11.50	11.25	11.25
Copper, light, and bottoms	10.00	9.25	10.25
Lead, heavy	5.00	5.50	5.75
Lead, tea	4.00	4.25	4.75
Brass, heavy, yellow	7.50	....	7.25
Brass, heavy, red	9.50	9.50	9.00
Brass, light	6.00	5.25	6.50
No. 1 yellow brass turnings	7.00	6.00	7.00
Zinc	3.75	3.00	4.00

TIN PLATES—American Charcoal—Bright—Per box.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	$25.10	$19.50	$18.50
"A" Grade:				
IC,	20x28, 112 sheets	21.40	17.00	17.00
	Coke Plates—Primes, 20x28 in.			
100-lb.,	112 sheets	14.00	12.60	14.50
	Terne Plates—Small lots, 8-lb. Coating			
IC,	14x20	8.25	6.55	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.10@0.13	$0.15	$0.11
Cotton waste, colored, per lb.	.08@.13	.12	.08
Wiping cloths, 13½x13½, per lb.	11.00	36.00 per M	.10
Wiping cloths, 13½x20½, per lb.	....	52.00 per M	.13
Sal soda, per 100 lb.	1.65	2.25	2.65
Roll sulphur, per 100 lb.	3.85	3.25	3.50
Linseed oil, per gal., 5 bbl. lots.	.95	1.06	1.14
White lead, dry or in oil	100 lb. kegs.	New York,	14.00
Red lead, dry	100 lb. kegs.	New York,	14.00
Red lead, in oil	100 lb. kegs.	New York,	15.50
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$4.50@5.00	
Coke, prompt foundry, Connellsville	per net ton	5.50@6.00	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40-10%	50-10%	45-5%
1½ and 1¼x3 in. up to 12 in.	15%	50%	50%
With cold punched hex. nuts up to 1 in. diam. (plus std. extra of 10%)	25-10%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30-10%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	List net	List net	.....
Hex. head and hex. nut bolts	List net	.....	65-5%
Lag screws, coach screws	40-10%	.....	60-5%
Square and hex. head cap screws	60%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30-10%	45%	40-5%
Bolt ends, with hot pressed nuts	40-10%	.....	55%
Tap bolts, hex. head, list plus	35%	.....	.....
Semi-finished nuts, ⅞ and smaller	60%	.....	....
Semi-finished nuts, ⅞ and larger	55%	65-10%	80%
Case-hardened nuts	40%	.. ....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.50	$4.00	$3.50
Washers, cast iron, ⅜ in., per 100 lb. (net)	5.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	1.50	4.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, hot pressed, hex., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, sq., per 100 lb. Off list	0.50	2.75	2.50
Nuts, cold punched, hex., per 100 lb. Off list	0.50	2.75	2.50
Rivets:			
Rivets, 7/16 in. dia. and smaller	50-10%	50-10%	60%
Rivets, tinned	50-10%	50-10%	4½c. net
Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb. (net)	$5.50	$3.90	$3.75
Cone heads, ditto (net)	5.60	4.00	3.85
1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb.	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base

	New York	Cleveland	Chicago
Lard cutting oil (50 gal. bbl.) per gal.	$0.55	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.297	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, 2c. per sq.in., per ply:			
Medium grade	30-10%	30-10%	30-10%
Heavy grade	20-5-2½	30%	20-5-2½%
Rubber and duck:			
First grade	.50-10-5%	50-10%	40-10%
Second grade	60-5%	60-5%	60-5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$6.30	$5.84	$6.48
Emery paper	9.90	11.00	8.80
Emery cloth	31.12	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll.	4.73	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1 49	1 24	1.40
Cloth	3.38	2.67	3.20

Tex., Garland—W. A. Holford—7-column quarto drum, 3 revolution newspaper press.

Va., Boydton—Baptist & Goode (wheelwright)—machinery for the manufacture of single tree irons.

Va., Martinsville—H. C. Field & Co. (mica products)—portable air compressor, jack hammer and drill.

Va., Williamsburg — W. B. Bozarth — planer and circular saw for box factory.

Wis., Appleton—Helm Cut Stone Co., 578 Locust St.—stone cutting machinery, including one 5 ton and one 12 ton hand operated crane, small chain hoists, carborundum saws, polishing machines, etc.

Wis., Astico—Astico Milk Products Co. (manufacturer of condensed milk)—special machinery, belting and shafting.

Wis., Berlin—Berlin Tanning & Mfg. Co. —special machinery, belting and shafting for proposed $50,000 tannery, to replace that which was recently destroyed by fire.

Wis., Black Earth — Lakeside Mfg. Co. (manufacturer of dishwashing machinery, etc.)—one brass furnace, several moulding machines, also complete nickel plating and baking-on equipment.

Wis., Hartford—Bear Brand Hosiery Co.—textile machinery for proposed $40,000 factory.

Wis., Juda—Bd. Educ., J. W. Roderick, Secy.—manual training equipment, woodworking machinery, etc., for new high school.

Wis., Madison—J. Fischenick, 2201 University Ave.—gasoline storage tanks, pumps and free air service equipment for new garage.

Wis., Madison—Heilprin Fruit Co., West Mifflin and Bedford Sts., J. Heilprin, Pres.—large ice machine.

Wis., Madison—Mead & Seastone, State Journal Bldg.—two traveling gate hoists for hydro-electric plant.

Wis., Madison—Piper Bros. Co., 31 North Pinckney St., S. Piper, Mgr.—electrically operated baking machinery, mixers, belting, shafting, etc., for proposed $50,000 bakery.

Wis., Milwaukee—Natl. Distilling Co., 79 Buffalo St., A. M. Grau, Purch. Agt.—belt driven conveying machinery.

Wis., Milwaukee — L. Rohn, 36th and Sycamore Sts. (manufacturer of automobile bodies, etc.)—one circle saw and one bandsaw.

Wis., North Milwaukee—C. G. Johnson—foundry equipment, including cupola, moulding machines and ladles.

Wis., Prentice—Northern Publishing Co.—presses and paper cutter for proposed $40,000 plant.

Wis., Stevens Point—Bd. Educ., c/o Clk., City Hall—sheet metal working equipment, printing presses and type machines for new $200,000 high school.

Wis., Weyauwega—Baldwin Mill Cheese Co., R. F. D. 1—dairy and creamery machinery, to replace that which was destroyed by fire.

Ont., Almonte — Yorkshire Wool Stock Mills Co.—about $50,000 worth of machinery to replace fire loss.

Ont., Elora—T. E Bissell Co.—machinery for addition to plant for the manufacture of farm implements.

Ont., Toronto—Boake Mfg. Co., Dartnell Ave.—sash and door machinery, including planers, saws and tenon machines for proposed $150,000 woodworking factory.

Que., Montreal — Imperial Printing Co., Registered, 22 Notre Dame St., East—14 x 22 in. Chandler press.

Que., Montreal — Laurentian Timber Products Co., Ltd., c/o J. Coderre, 6331 St. Charles St.—complete sawmill equipment for new plant.

Que., Montreal—Maisoneuve Box & Lumber, Ltd., 5th Ave. and Girard Sts., Viauville, R. Dursavet, Purch. Agt.—one power feed rip saw.

Que., Montreal — L. Villeneuve & Co., Ltd., 2599 St. Lawrence Blvd., M. Paquette, Purch. Agt.—bandsaw and other equipment for sash and door factory.

Que., St. Sebastien—A. Tetreau—equipment for blacksmith shop and wheelwright repairs.

Metal Working Shops

Calif., Woodland—The trustees of Woodland High School Dist. will receive bids until Sept. 27 for the construction of 1 story manual training shops, 200 ft. long. Estimated cost $40,000. W. H. Weeks, 369 Pine St., San Francisco, Archt. Noted Aug. 30.

Conn., South Manchester—H. Stephens, 161 Center St., is having plans prepared for the construction of a 1 story (ultimately 3 story), 60 x 90 ft. garage, etc. Estimated cost $40,000. R. M. Gosler, 19 Madison St., Archt.

Conn., West Hartford (Hartford P. O.)—Prospect Garage, Prospect Ave., awarded the contract for the construction of a 1 story, 100 x 100 ft. garage. Estimated cost $40,000. Noted July 26.

Fla., Dade City—The Dade City Motor Co. will soon award the contract for the construction of a 2 story, 30 x 60 ft. garage. Estimated cost $10,000. Private plans.

Ill., Chicago—L. Bromberg, 1337 North Oakley Blvd., is receiving bids for the construction of a 1 story, 100 x 250 ft. automobile sales and service station on Milwaukee Ave. near Crawford St. Estimated cost $100,000. A. M. Ruttenberg, 64 West Randolph St., Archt.

Ill., Chicago—F. E. Gotterdam, Archt., 138 North La Salle St., is receiving bids for the construction of a 2 story, 50 x 72 ft. factory at 1908-14 Park Ave. for the Crown Rheostat & Supply Co., 35 South Desplaines St., manufacturer of plating and polishing material and equipment. Estimated cost $28,000.

Ill., Chicago—The D. O. James Mfg. Co., 1120 West Monroe St., manufacturer of cut gears, awarded the contract for the construction of a 3 story, 48 x 50 ft. factory at 1114-1118 West Monroe St. Estimated cost $50,000. Noted Aug. 23.

Ill., Chicago — F. E. Jonas, 133 West Washington St., awarded the contract for the construction of a 1 story, 100 x 125 ft. automobile sales and service station at 3417-25 Diversey Parkway. Estimated cost $45,000.

Ind., Lafayette—The J. F. Horner Automobile Co., 19th and Columbia Sts., plans to build a 1 story, 40 x 130 ft. garage. Estimated cost $40,000.

Ind., Pendleton—The Indiana Reformatory plans to build a 1 story foundry. Estimated cost $40,000.

Ky., Louisville — The Ford Motor Co., Highland Park (Detroit P. O.), plans to build an assembly plant on a 22 acre site, capacity 300 cars per day, on Western Parkway, here. Estimated cost $1,000,000.

La., Monroe — The Acme Carbon Mfg. Corp., Ouachita Natl. Bank Bldg., plans to build thirty 12 x 120 ft. burning houses, 25 x 75 ft. warehouse, 30 x 50 ft. packing house, 20 x 30 ft. machine shop, etc.

La., New Orleans—M. Feitel, 3722 Tulane Ave., is having plans prepared for the construction of a 1 story, 125 x 155 ft. garage on Constance and Poeyfarre Sts. Estimated cost $20,000. Harry Bros., Carrolton Ave. along tracks of Yazoo and Mississippi Valley R.R., Archts. Toye Bros. Taxi Co., South Rampart and Gravier Sts., lessee.

Mich., Detroit — H. C. Nicholson, 5843 Commonwealth Ave., awarded the contract for the construction of a 1 story, 60 x 136 ft. garage on Commonwealth Ave. Estimated cost $40,000.

Mich., Detroit — Pitman & Thieme, c/o S. E. Remey, Archt., 1140 Griswold St., is having plans prepared for the construction of a 1 story, 90 x 120 ft. garage and repair shop on Hamilton Blvd. Estimated cost $40,000.

Mich., Detroit—The Texas Co., 17 Battery Pl., New York, awarded the contract for the construction of a distribution plant, including a 1 story, 38 x 122 ft. warehouse and office building, 32 x 100 ft. garage and power plant, steel tanks, etc., on Ferndale Ave., here. Estimated cost $100,000.

Minn., Minneapolis — The Minnehaha Welding & Machine Co., 3750 Minnehaha Ave., plans to build a 1 story, 40 x 150 ft. machine shop. Estimated cost $12,000.

Minn., St. Paul—The Western Fruit Express Co., 1505 Pioneer Bldg., is having plans prepared for the construction of a repair shop for refrigerator cars in the Midway district. Estimated cost $50,000. F. G. Luth, Mechanical Supt. Private plans.

Mo., Kansas City—The Kansas City Light & Power Co., 1330 Grand Ave., has had plans prepared for the construction of a 1 story, 160 x 180 ft. garage on 19th and Charollette Sts. Estimated cost $90,000. Private plans.

Mo., St. Louis—P. H. Fuchs, 3126 Locust St., awarded the contract for the construction of a 1 story, 89 x 117 ft. garage at 608 South Bway. Estimated cost $40,000.

Mo., St. Louis — The Heine Boiler Co., 5319 Marcus Ave., awarded the contract for the construction of a 1 story, 80 x 139 ft. factory. Estimated cost $50,000.

Mo., St. Louis—The Tate Motor Car Co., 3111 Locust St., awarded the contract for the construction of a 3 story, 135 x 165 ft. automobile sales and service station on Washington St. Estimated cost $250,000. Noted July 5.

Neb., Omaha—The Fairmount Creamery, 12th and Jones Sts., awarded the contract for the construction of a 2 story, 132 x 132 ft. garage, etc. Estimated cost $90,000.

N. Y., Saratoga Springs—The Baker Mfg. Co. has had plans prepared for the construction of a 1 story, 50 x 87 ft. foundry unit on Ballston St. Estimated cost $50,000. Private plans. Noted May 24.

N. C., Raleigh—J. W. Evans, East Morgan St., plans to build a 2 story, 100 x 100 ft. automobile and general repair shop on Blount and Morgan Sts. Estimated cost $50,000. Engineer or architect not announced.

Utah, Salt Lake City—A. Kahn, Archt., 1000 Marquette Bldg., Detroit, will receive bids until Sept. 24 for the construction of a 2 story, 165 x 247 ft. assembly plant on 3rd South St., here, for the Ford Motor Co., Highland Park (Detroit P. O.).

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